Trauma and Surgery in the Crusades

to the Medieval Eastern Mediterranean

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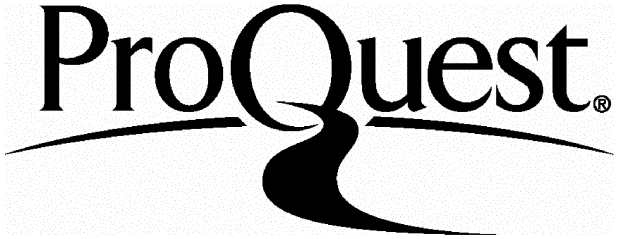

Abstract

When we think of the crusades the first thought that most people have is of the medieval battlefield. This study investigates the evidence for weapon injuries as well as the treatment given to the injured in the Frankish states during the 12th and 13th centuries.

A number of named medical practitioners have been identified as having joined one of the crusades from Europe and many indigenous doctors continued to practice once the crusaders arrived. Over sixty individuals are discussed, with origins from France, England, Italy, Hungary, Spain and the Middle East. Hospitals were established as fixed institutions in towns but also mobile field units that accompanied the army. There is detailed information about daily life, disease and treatment in the hospitals of a number of the major military orders such as the Order of St. John and the Order of the Temple. These are compared with hospitals known in neighbouring Islamic and Byzantine regions. The textual evidence for weapon injury and it's treatment allows an assessment of the proportion of individuals who died from weapon injuries as opposed to malnutrition and infectious disease. Surgery as actually practiced for wounds is presented, from the removal of arrows, suturing of wounds, manipuLating limb fractures, treatment for skull fractures and excision of overgrown fungating tissue from the gums resulting from scurvy.

The research presented here employs complimentary historical and archaeological techniques to investigate weapon injuries and their treatment in the crusades and gives a vivid depiction of the appalling conditions experienced by the medieval soldier.

Table of Contents

	Page
Introduction	5
Medical Practitioners in the Frankish states	11
Hospitals on the Battlefield and in the Towns	53
Trauma and its Treatment	125
Conclusion	182
Bibliography	187

List of Tables

	Page
Table 1	51
Salary Given by King Louis IX to his Crusading Medical Staff (1250-60).	
Table 2	115
Foods Forbidden to the Sick in Hospitaller Orders and Medical Texts.	
Table 3	116
Foods Encouraged to the Sick in Hospitaller Orders and Medical Texts.	

Introduction

The crusades could be said to be the most fascinating of all events that took place in the medieval world. The mass migration in sequential waves of hundreds of thousands of people from Europe to the eastern Mediterranean for such a disparate number of reasons led to a complex and unique society. The armies were not just comprised of trained soldiers but ranged from the nobility to paupers, clergy to criminals, businessmen to con artists (Setton 1955-89; Mayer 1988; Riley-Smith 1991; Riley-Smith 1999a). The First Crusade set out for Jerusalem in 1096 and the invaders established the kingdom of Jerusalem in the south, the county of Tripoli in the centre with the principality of Antioch and county of Edessa in the north. The island of Cyprus was added to these states during the Third Crusade in 1189-92. While the king was based the city of Jerusalem in the twelfth century, after the loss of Frankish territory following the battle of Hattin in 1187 the monarchy moved to the coastal city of Acre. Nearly two hundred years after the initial conquest, the loss of Acre in 1291 effectively signified the end of the mainland Frankish states. The scramble of individuals, military groups and religious organisations for land, power and royal favour with each conquest or defeat would alone make things interesting enough to study. To make the situation even more complex we see the interaction between the crusaders and Frankish settlers with the local Christians, Jews and Muslims who lived under Frankish rule and also relations with the neighbouring Christian kingdoms of Armenia and Byzantium to the north and Muslim territory to the northeast, east and south of the Frankish states. Needless to say this cultural melting pot would be expected to have profound implications upon diseases of all kinds as well as the efforts made by medical practitioners to treat their patients. For the many crusaders who may never have ventured beyond the next village prior to their

expedition the journey itself was enough of a challenge (Hamilton 1999). The overland and sea routes could lead to malnutrition, frost bite, drowning and the potential for the spread of communicable conditions from fleas to tuberculosis. An individual with a culture and an immune system developed for cooler northern Europe may have been at considerable risk migrating to the Middle East. Firstly they would encounter new diseases to which they may have little immunity, such as dracunculiasis and schistosomiasis. Furthermore, with their culture developed for a different region may have increased their risk of succumbing to conditions resultant from the different climate, such as heat stroke, food poisoning or famine from crop failure. Medicine and disease in the crusades are topics that have clearly interested historians for many years (Walsh 1919; Ell 1996; Ficarra 1996; Dolev 1996). This interest appears to be increasing as the last decade has seen more than twice as many articles published on this topic than the entire total produced prior to 1990. The work of Susan Edgington, Benjamin Kedar, Tony Luttrell and others have brought refreshing insight to particular aspects of medicine in the Latin East.

The sources that provide evidence for this project can broadly be divided into written texts and archaeological excavation. A large number of chronicles were written that described events during the crusades and over forty have provided evidence for this study. Some were written by soldiers or clerics participating on a particular crusade and recorded their journey so they could tell those from their home town on their return what the experience was really like. These often saw events from the perspective of a particular subgroup of the crusade, such as those from a particular region of Europe or those in the entourage of a certain noble. In consequence the version of events tend to favour members of their own group and are more prone to discrediting or gossiping about the activities of other sections of the army. This is especially the case when old rivalries already existed between these groups back in Europe. Many pilgrims travelling in peacetime also wrote of the route they took and noted the

highlights along the way. While some were secular, a significant proportion of these accounts were written by clerics, for the use of other clerics. Others who had never been to the Latin East used the works of these eye witnesses to write works themselves, and these 'second hand' chronicles have to be interpreted with appropriate caution. Even amongst the eye witness works there was plenty of plagiarism and sections copied from older sources. Sometimes this was because certain areas were unsafe for pilgrims to travel to allow a first hand report, while other sources were copied as they were regarded as infallible (Wilkinson 1988 p.2-3). Some Frankish settlers undertook formal histories of their own kingdom that often covered much longer time periods than the detailed but short term coverage in the texts by the transient Europeans. The indigenous Christian communities that lived in areas covered by the Frankish states continued their own historical traditions and several chronicles in Syriac recorded life under the Franks. The Byzantines to the north were another group that seemed to experience a love-hate relationship with the Franks, sometimes intermarrying and fighting side by side with them and other times fighting against old enemies who also happened to be crusaders. The neighbouring Islamic states to the north, east and south of the Frankish states were all prolific in the recording of historical events and some of this understandably addressed the interaction between themselves and these invaders from Europe, both when at war and in peacetime (Hillenbrand 1999 p.9). Two twelfth century Islamic works are extremely useful for their descriptions of the Frankish kingdoms and are examples of some of the pitfalls in the use of any written source. Ibn Jubayr was a pilgrim from Spain who passed through the kingdom of Jerusalem on his return from Mecca (Ibn Jubayr 1952). While his observations on life in the Latin East are fascinating, he was just as prone as any of us to memory lapses and he was on occasion misled by the erroneous testimony of his guides. Usama ibn Munqidh personally witnessed many battles and events in the era of the crusades. His 'autobiography' is not an autobiography in the western sense,

where important or representative episodes are collected together to summaries the authors life. It instead belonged to a genre of arabic literature known as *adab*, which aimed to instruct but also amuse and please its readers. It was perfectly acceptable to stretch the truth to make a point and a number of the stories were probably stereotypes rather than actual incidents. However, if we can see past the moral of each story and attempt to extract the more plausible information then his memoirs can be extremely useful (Hillenbrand 1999 p.262). This has left a wide range of very different chronicles, all written from different perspectives and with different hidden agendas. Some were written in the Latin East by eye witnesses but others were transcribed at a great distance from the events taking place, by those who could only base their work on the tales of others. While many were contemporary, a number were written decades after the event and as such some of the facts may have blurred in the witnesses minds. Some were written in a factual manner while others were created as a good story for the listener. There is evidence from Greco-Roman times that such epics with a recreational as well as historical function often included fabricated examples of battle scenes to make the story more exciting (Salazar 2000) and it is possible the same technique was used in the medieval period too. However, if such fabricated episodes were included then we would expect them to be at least plausible to the medieval listener and so still give some kind of a guide to contemporary medical practice where this is mentioned. Clearly the need to fabricate would have been much less likely in works by eye witnesses to events and in those accounts describing the experiences of named individuals, in contrast to others who wrote of the crusades from a different place and time. This heterogeneity among the sources allows integration of the views from each perspective to perhaps allow a more balanced opinion to be constructed. However, the strengths and weaknesses of each source must also be considered before accepting each sentence at face value. Having considered the possibilities and pitfalls from use of the chronicles, there remains a wealth of other textual sources that

contain relevant information. These include legal texts from the Latin East, letters written on campaign to relatives at home, the wills of those who were dying, the deeds of property sale in Frankish towns as well as military and religious order cartularies. European sources include royal court records, papal bulls, academic medical texts and monastic histories of those countries who participated in the crusades. Clearly each of these has the potential to act as indirect sources of information with regards to Frankish medical practice, although only a small proportion of each source will be relevant. The structured integration of the facts from such disparate sources is clearly fraught with difficulties but does greatly improve our knowledge of trauma and its medical treatment in the crusades. Archaeological excavation has provided information both from the recovery of crusader period human skeletal remains but also of buildings and the bioarchaeological analysis of appropriate sites. Palaeopathological study of Frankish cemeteries can provide clear proof for weapon injuries and many diseases that leave their mark on bone. The excavation of hospitals helps us to visualise the locations where written sources confirm that medical treatment took place. Bioarchaeological analysis of soil samples from Frankish sites provides evidence such as animal bone fragments, parasitic intestinal worm eggs, pollen and seeds that help us to understand just how they lived their lives. Frankish sites discussed include cities such as Acre, Jerusalem and Nablus, and also fortifications such as Belmont Castle, Jacob's Ford, Le Petit Gerin, Paphos and the Red Tower.

Unlike the study of more recent medical advances, research in crusader and Frankish medicine utilises archaeology and palaeopathology, cartography and manuscripts written in the many different languages of the both the crusaders and also those already living in the eastern Mediterranean. To interpret these textual sources requires proficiency in medieval Latin, Greek, Arabic and Syriac as well as the various vernacular languages of France, Italy, England, Germany and Spain. It is very unlikely that one individual will ever have expertise in

all these historical and archaeological areas and this may be a significant reason as to why no large studies have been conducted in the past. I do not pretend to to be expert in all the above languages, but despite these limitations the evidence accumulated for this work is very large. I have chosen to concentrate on weapon injuries and their treatment, since the battlefield is usually the first image that springs to mind when the crusades are considered. Associated topics that compliment this core theme are also investigated, including the evidence for medical practitioners and hospitals.

This thesis presents the evidence for the surgical treatment of trauma in the Latin East and places it in the context of the medieval world. The integration of the textual and archaeological evidence has often been used to draw conclusions that each speciality alone could not substantiate. It is hoped that these conclusions will help our modern understanding of how the crusaders and Frankish settlers coped with the enormous challenge they faced just to stay alive in the face of such adversity.

Medical Practitioners in the Frankish States

In the course of the two hundred year history of the Frankish states it is likely that at the very least several hundred thousand people travelled to the eastern Mediterranean. Amongst them it would not be surprising if several hundred, if not thousands, would have been medical practitioners. Even if we disregard those whose primary reason for the journey was a pilgrimage to Jerusalem rather than to practice their trade, we should still be left with a significant number. Many had no choice but to go since it was their duty to accompany their local nobility when they participated in a crusade. Others appear to have been under contract with their city authorities to attend the wounded from that town when their army was in action. Others still may have gone east for a fresh start or just to make money as so many other Europeans did, be they soldiers, farmers or prostitutes.

While there are many references in contemporary chronicles to the activities of doctors in the Frankish states, there has been very little work on named individuals other than Wickersheimer's preliminary work fifty years ago (Wickersheimer 1951). It seems that on the whole the records have preserved details on only the most prestigious individuals, which is not too surprising. This group was typically well educated, often having studied medicine at renown centres of learning such as Salerno, Montpellier, Paris, Bologna or Padua (Bayon 1953; Morris 1992; Siraisi 1994). Several years study of the liberal arts (grammar, rhetoric, logic, arithmetic, astronomy, geometry and music) gained them the title 'master' (*magister*) and a further period concentrating the theory as well as the practical application of medicine completed their medical credentials. However, this fact does mean that those masters in the following discussion should not be regarded as representative of the larger group of crusading medical practitioners as a whole. It is likely that many of these would be less well educated, often learning their trade by apprenticeship rather than at a university

(O'Boyle 1994). Fortunately, terms used to describe practitioners in the medieval period usually enable us to distinguish the various grades of competence in both the practice and theory of medicine, although the meanings did change over time (Jacquart 1981). The *medicus/miege/mire* was the broad term commonly used to designate a doctor in the medieval period. They would take a history and examine the patient's pulse and urine (Wallis 2000) and then prescribe alterations to the diet, drugs and bloodletting as required. Many also practiced surgery and treated wounds. Some also had the title master, showing an academic training at a university or other centre of learning (Siraisi 1994). In examples from the Frankish states a number of doctors referred to by the Latin term *medicus* were masters, but none of those referred to with the French *miege/mire* were. Those who were not masters would not have gone to university but probably trained by apprenticeship for some years under another doctor. Sometimes the word *mire* took on a much broader meaning and was used for any medical practitioner, including barber, apothecary or folk healer. The *physicus/fisicien* (Bylebyl 1990) designated a doctor with a high level of theoretical knowledge of natural science and medicine, together with study of the liberal arts at university. The majority of these *physici* at the time of the crusades seem to have been clergy. The *cirurgicus* was a surgeon, a term which only became common in the thirteenth century although it did exist before that. Surgeons are commonly thought to have been less well educated than *physici* and were looked down on by some physicians, who saw surgery as a manual trade. While surgery was usually taught via the apprenticeship method in the twelfth and early thirteenth centuries (McVaugh 2000) by the end of the thirteenth century it was a subject studied at universities in southern Europe (Sigerist 1943; Bullough 1960; Siraisi 1973; Siraisi 1981) and a number of surgeons had the title master. Their job was more hands-on than the *physicus* (so were sometimes termed *practici*) since they would bandage or suture wounds, manipulate fractures and operate with a range of surgical instruments. The *barberus/rasorius* was poorly

educated and tended to learn his trade as an apprenticeship. Barbers could perform bloodletting, some minor surgical procedures, wound care in battle and shaving. The *minutor/phlebotomus/sanguinator* was also poorly educated and only able to bloodlett. He could treat on the instructions of a doctor or be approached directly by a patient. Sometimes they were waged employees of a hospital. Both the barber and bloodletter became more common in the thirteenth century as there was a decline in the amount of bloodletting performed by doctors themselves. The *apothecarius/herbolarius/spicer* would prepare drugs on the instruction of a doctor, but would also sell direct to patients who came to them for help. Again, the apothecary became more common in the thirteenth century as doctors prepared fewer drugs themselves (Trease 1959; Matthews 1967). While I have been unable so far to identify any named apothecaries from the Latin East, there are references to apothecary's shops in Antioch and Tyre (Urkunden 1856, 2, p.359; Cartulaire de Saint Sepulchre 1984 p.177) . A collection of pharmacy jars has also been excavated from a thirteenth century shop at Acre (Stern 1999) and such evidence does confirm the existence of apothecaries. A good example of the different titles for medical practitioners can be seen in the infirmary of the Hospital of St. John of Jerusalem in the 1180s. Statutes of the order dating from 1184-5 show that there were four *medici* and four *chirurgici* (Cartulaire General, vol.1, cart. 690, p.458). Other manuscripts from the same time refer to the four general doctors as *mieges* and state that there was a *fisicien* employed to look after the weakest patients there (Edgington 1998; Kedar, 1998). *Minutores* were also hired to bleed the patients on the instructions of the doctors.

Medieval Spain has often been seen as a parallel to the Latin East, since both populations were made up of Christians, Jews and Muslims and both were frequently in a state of crusade, with long term military confrontation between Christian states and neighbouring Muslim regions. The structure of medical practitioners in Spain may, therefore,

be of interest when investigating the profession in the Latin East. It seems that Jews and Muslims practiced there alongside Christians (Garcia-Ballester 1987; Garcia-Ballester 1994) and both Jews and Christians treated the Aragonese royal family in the early fourteenth century (McVaugh 1994). At the end of the thirteenth century, the king of Aragon employed a personal physician (*fisicus*), an apothecary, at least two barbers and also three surgeons who lived away from court and attended the king when summoned (McVaugh 1993 p.6-7). In times of crusade when Christian states were at war with neighbouring Muslim kingdoms there are also records of the medical facilities provided. A number of named surgeons, physicians, barbers and apothecaries have been identified at the siege of Almeria in Granada under King James II of Aragon in 1310. Arnold of Villanova also wrote a short medical work on advice on health in the king's army for this campaign and covered matters such as the healthiest place to site the army camp, how to check if water is safe to drink, the importance of burying the dead quickly in mass graves and how to treat those with weapon injuries (McVaugh 1992).

There has been much confusion over the years as to the position of the church on the role of clergy in medicine. In the twelfth century the practice of medicine appears to have been permitted to everyone, but in the Council of Tours in 1163 it was forbidden for clergy in religious orders from leaving their monasteries and abbeys to study medicine or law in a secular environment (Sacrorum Conciliorum 1776, vol.21, col.1179, canon 8). It was not medicine that was the problem but the period spent away from the religious environment that caused the objection. The secular clergy, who lived with the general population anyway, could still study medicine without controversy and the regular clergy could do so within the confines of an appropriate religious establishment. In 1215 canon 18 of the Fourth Lateral Council forbad certain clergy (subdeacons, deacons and priests) in religious orders from practicing surgery involving incisions or cautery (Disciplinary Decrees 1937 p.258 canon 18) as it was believed to preclude them from saying mass. This did not apply to minor clergy

who did not consecrate the eucharist (such as porters, acolytes, exorcists and lectors) nor the secular clergy and these two groups actually made up the majority of clerics. Similarly there was no prohibition against anyone practicing aspects of surgery where no tissue damage was caused by the technique employed, such as setting broken bones or treating wounds with poultices. In 1266 the surgical author Theodorich became Bishop of Cervia (Theodorich Borgognoni 1955) and in 1276 the oculist Peter of Spain became pope (John XXI) so clearly being a surgeon did not necessarily preclude advancement within the church (De Rijk 1970). The old quote of *ecclesia abhorret a sanguine* (the church abhors the shedding of blood) appears never to have come from a medieval document (Talbot 1967 p.55) despite its inclusion in almost all medical history books.

Medical practitioners' income in Europe varied greatly depending on their occupation, training, academic knowledge and employer (Hammond 1960; Rawcliffe 1988). The best paid were the physicians in royal courts who received a regular salary from the king after years of training in medical theory and practice in universities. Often they would be given lucrative ecclesiastical appointments on their retirement from court (Rawcliffe 2000). Next came the royal court surgeons who earned a little less but still became very rich. Payment may have been in cash or the rights to the incomes from an estate or other source. Other benefits such as expensive clothing are commonly recorded in the manuscripts. Lesser educated practitioners were also often salaried in royal courts, such as the barbers and these earned correspondingly less. Outside the system of patronage the practitioners had to rely on fee for service rather than a fixed retainer. Clergy who were qualified in medicine would have received regular income from their clerical duties and some accepted intermittent fees from treating the sick, although they were not supposed to do so (Getz 1998 p.6-7; Rawcliffe 1988). Practitioners outside the clergy who worked with the general population, such as the surgeons and barbers, typically worked just on a fee for service basis. It was often thought best to fix the fee when

the patient was at their most unwell as they would agree to a higher price at that time (Jarcho 1944).

While there does not appear to have been much specific regulation of doctors while travelling on a crusade, once the fighting had stopped and peace returned the laws of the Frankish kingdoms came into force. The laws of the Frankish states that specifically cover medical licensing, clinical practice and negligence were the *Assises de la Cour des Bourgeois* (Assises de Jerusalem 1843, vol.2, 164-9; Grandclaude 1923). They are thought to have been collected together in their final form around 1240-44 in Acre but many sections significantly predate this time (Prawer 1951). A further function of the surgeon is shown in another collection of legal documents, the *Assises de la Haute-Cour* (Assises de Jerusalem 1841, vol.1, p.338-40; Brittain 1966). Here it is shown that those inhabitants of the Frankish states who claimed to be too ill to attend court had to undergo medical examination to confirm if this was true. This was to ensure that people did not fake illness to avoid their responsibilities. If the problem was a weapon injury or surgical problem then a *selorgien* was required to inspect it. A *fisicien* or *miege* was sent to assess pulse and urine if the complaint was a medical problem. These doctors would then report back and confirm whether or not the excuse was reasonable.

A number of Latin doctors are mentioned as witnesses in legal documents from the crusades. Some of these were written in the confusion of the army camp, where it might be expected that anyone academically trained might have been asked to witness documents. However, many were drawn up in optimal conditions, such as a major city in times of peace, and it has been proposed that it may have been normal for doctors to act in a legal capacity (Brundage 1993). While a small proportion were described in the texts as a *notarius* (professional draughtsman of legal documents), most are not. The legal role of doctors in the Latin East is an interesting one. Many are noted just once in the records, which might suggest

that they were passing through on a crusade or pilgrimage to Jerusalem. Others are mentioned in documents dated a number of years apart which might suggest that the doctor had actually settled in the area.

Some medical practitioners are known to have definitely gone on crusade by references to their actual presence there. They may have witnessed a charter drawn up in a Frankish city, been referred to in a document or included in a contemporary historical work describing the crusade in which they took part. Others can be considered as very likely to have gone on crusade if there are records showing that they were in the service of a particular king or nobleman both before and after a crusade in which that the noble is known to have taken part. Supportive evidence for these cases may sometimes be found in the form of records of papal indulgences or protection for their estate while they are abroad. It is well accepted that just having the name of a noble on a list of those who 'took the cross' did not guarantee participation on a crusade, as some later changed their minds and bought their way out of their obligation with a donation to the church. However, doctors in the service of a noble would not have been in a position to do this, so that if their patron is known to have gone east then we can be reasonably certain that the doctor did too. Some doctors wrote medical works in their later life and actually described diseases or treatments which they mention encountering on crusade when they were younger.

For others there may be less definite evidence for their involvement in the crusades but sufficient circumstantial information to make it possible or even probable. A record from within a year or two before or after a crusade showing a doctor in service to a noble who is known to have gone makes such a case possible. Any noble with a doctor in his service would have been bound to include him in his crusading entourage and would not really have left the doctor any choice but to go. It is of course possible that the doctor mentioned may have died or retired from service just before the crusade or alternatively just started working for the

noble after their return from crusade. In view of this, there will always be some element of doubt as to the participation of practitioners with this less definite, circumstantial evidence in the records and so the evidence must be used with a little caution.

The following individuals have been arranged according to their country of origin. Within each group they are discussed in chronological order to highlight the evolution of the medical profession over the two hundred year period in which the mainland Frankish states existed.

French Practitioners

The most common country of origin for medical practitioners who went on crusade seems to have been France. This is not too surprising as they were the major crusading nation in the medieval period and the dominant culture within the Frankish states themselves. The earliest reference to a doctor yet encountered is for the *medicus* Geffroi, who came from Nantes. He was witness to the will of Count Herbert of Thouars drawn up on 28th May 1102 at Jaffa (Cartulaires de Bas-Poitou 1877; Wickersheimer 1936 p.177). Count Herbert had heard that his brother had died (although this wasn't in fact the case), took the news rather badly and subsequently become seriously ill.

King Louis VII of France participated in the ill fated Second Crusade of 1147-8, along with Conrad III of Germany (Odo of Deuil 1948). While no specific references to his medical staff in the east have so far come to light, it is highly improbable that he would have left this section of his court behind. Likely candidates for the expedition include Master Pierre Lombard. Master Pierre was King Louis' physician (*physicus*) in the years leading up to the crusade, referred to in 1138 (Glossarium 1733, 1, p.643). His obituary in Chartres Cathedral described him as physician to the king and also canon at the cathedral (Cartulaire de Notre

Dame 1865 vol 3, p.25). The record shows that he died on January 19th but unfortunately does not specify which year. Another theoretical possibility is Caius Clodius Cervianus, who was the doctor to Queen Eleanor, Louis VII's wife. He was a Provençal by birth and wrote works on epidemics, astronomy and geography (Anon. 1750 p.193). Unfortunately little is known of the actual dates he worked in the royal court or whether he travelled on the crusade.

Eudes de Champagne (Odo Campanus) was a French astrologer who lived in the second half of the twelfth century. He made a journey to Jaffa at the end of the twelfth century and refers to this in his book '*Libellus de Efficatia Artis Astrologice*', which he is believed to have written some time between 1192 and 1202. This text itself appears to have been lost but large sections of it are quoted in the work of another French astrologer named Helinand de Froidmont, who lived between c.1160 and c.1229. Helinand lived in a monastery near Beauvaisis and it was there he wrote his *Chronica*, also known as the *Disputatio Contra Mathematicos,* around 1210-1216 (Eudes de Champagne 1974). It has been suggested (d'Alverny 1967) that Eudes de Champagne travelled in the entourage of Count Henry of Champagne when he travelled east in 1190 to join the Third Crusade, later ruling the kingdom of Jerusalem between 1192 and 1197 (Continuation of William of Tyre 1996 pp.2,47). In the *Libellus* Eudes covers various aspects of astrology including his beliefs regarding the effect of the planets on the development and birth of the foetus. He thought that each stage of the pregnancy was governed by the planets and other heavenly bodies. Saturn governed the first month, Jupiter the second, Mars the third, the sun the fourth, Venus the fifth, Mercury the sixth and the moon the seventh. In the last two months the effects of Jupiter and Saturn were thought responsible for preparing both the fetus and the mother's uterus for the birth. In view of passages such as this it has been suggested that Eudes may have been a doctor as well as astrologer (Eudes de Champagne 1974). Many physicians of the twelfth century also studied astrology (French 1994) so this is quite a plausible hypothesis. It was widely believed that

bloodletting should be avoided at certain phases of the moon (Voigts 1984) and some doctors used the location of the planets in determining the prognosis of a sick patient (Sigerist 1942; O'Boyle 1991). However, Eudes is never actually referred to as a *medicus* or *physicus* nor given the title *magister*, so it is possible that he was primarily an astrologer who happened to have studied some medicine.

Master Gilles de Corbeil was physician to King Philip Augustus of France, who participated in the Third Crusade of 1189. One of Philip's other physicians, the Englishman Master John of St. Albans (discussed later), was referred to by Matthew Paris but he does not bother to give details of his French doctors. The chronicle *The Continuation of William of Tyre* recounts the illness of King Philip at Acre in July 1191 and clearly suggests that a number of doctors attended the king. 'He fell seriously ill of a double tertian fever. The illness afflicted him so grievously that he nearly died..... He sought out doctors and gave them fine jewels and begged them to comfort him and advise him as to how he could be quickly healed of his illness. The doctors offered their advice and God gave him grace to recover from his illness' (Continuation of William of Tyre 1996 p.108-9). There has been much discussion as to exactly what the various forms of tertian fever were (Jarcho 1987) and it is thought likely that they were umbrella terms for a number of infectious diseases including malaria. Master Gilles was in royal service from 1180-1223 so it is very likely the king would have brought him on the crusade. Gilles learnt his medicine in Salerno, moved to Montpellier for a time and then settled at the University of Paris to teach there (see O'Boyle 1998). He wrote a number of medical works including *Liber de urinis, Liber de pulsibus, Libri de laudibus et virtutibus compositorum medicaminum* and *Liber de signis et symptomatibus aegritudinum* (D'Irsay 1925; Rath 1964).

Magister Bertrandus and Magister Petrus Maurinus were *physici* present in Acre in 1221. They were witnesses to the will of Count Henry I of Rodez (1214-27), dated 18th

October, which was written as he lay sick in the House of the Hospitallers (Documents Historiques 1900 p.19; Wickersheimer 1936 p.649). Master Bertrand was described as a *notarius* as well as being a *physicus*. One possibility was that they were in the service of the Count of Rodez and they had survived the disastrous Fifth Crusade. This set out in 1217 for Egypt and surrendered to the Egyptian sultan in 1221, following which most of the forces who were allowed to go free headed to Acre to recover from their ordeal (Oliver of Paderborn 1948; Chronicle of Reims 1939). Another option to consider is that they may have been *physici* already in Acre, perhaps employed in the Hospital of St. John for sick poor or working on a fee for service basis in the town and called in for an opinion as such an important noble was lying sick in the hospital. Interestingly, a master Petrus was described in 1226 as *medicus* to Princess Isabelle, daughter of John of Brienne (Regesta Regni 1893 p.256 doc.975). John had become king of Jerusalem in 1210 when he married Queen Mary and after she died in 1212 he continued as regent to his daughter Isabel until 1225. Since the two documents mentioning master Petrus are dated so close together, it is interesting to speculate as to whether they may be referring to the same individual.

Guillelmus de Migeio was a *miege* from France who may also have gone on the Fifth Crusade. He is noted to have taken the cross in 1218 (Studien zur Geschichte 1891 p.112) but there has been no firm evidence found as yet to confirm his presence in the east (Powell 1986 p.224). Since he was not a university trained master it is unlikely that he would be called upon to witness documents. In consequence, his absence from the written record should not necessarily be used as evidence against his joining the crusade and it might be reasonable to regard him as a probable participant.

Hersende was a female physician to King Louis IX who went with him on crusade to Egypt in 1248-50. She is referred to, along with her wages of 12 Parisian deniers per day, in a document drawn up at Acre, dated August 1250 (Daumet 1918; Wickersheimer 1936 p.294-

5). The army travelled from Damietta to Acre in the Spring of 1250 after their release from captivity by the Egyptian commander, which explains her presence there at that time. It was unusual in the thirteenth century to have an educated female physician at all (Green, 1994; Talbot 1965; Wickesheimer 1936; Jacquart 1979) and especially unusual for her to become so well respected that she should become personal physician to one of the major kings in Europe. Her title '*magistre Hersende, physice*' and position suggest she may have had a university education at a centre of medical learning. In the 1250's she married an apothecary (*apothecario*) named Jacques and they set up house in Paris (Archives de l'Hotel Dieu 1894 p.534). Her marriage shows that she was not part of a religious order as many male physicians were at that time. It has been suggested that Jacques was also apothecary to Louis IX (Wickersheimer 1936 p.294-5). If that was the case, perhaps the long evenings Hersende and Jacques might have spent trying to cure Louis' dysentery (John of Joinville 1955 pp.24, 101) brought them close.

Other physicians from the Seventh Crusade include Robert de Duaco (Wickersheimer 1936 p.709-10). He was a *physicus* who went east with Louis to Egypt on 1249. He was a cleric from Douai who was also canon of Saint-Quentin and Senlis in in the 1240's alongside his royal duties. Initially he was physician to Louis' wife Marguerite de Provence (Riolan 1651 p.92; Chartularum Universitatis 1889 p.372-5), but by 1245 he was also physician to the king. Queen Marguerite went on the crusade with Louis but stayed in the coastal city of Damietta once it had been taken by the crusaders. Louis then moved inland with the troops and it appears that the royal medical staff split at that point. Master Robert stayed in Damietta with the queen (Berthaud 1907) while other doctors travelled with the rest of the army to treat the sick and injured during the campaign. Robert de Duaco survived the crusade to die in France on 20th May 1258 (Obituaires 1902 1(ii),p.744). Roger de Provins was a physician who might also have been on the same crusade with Louis IX. In 1246 he was

canon of Paris and of the Church of Saint-Quentin and he was recorded as being physician (*fisicus*) and chaplain to Louis IX in 1256 (Johannes Saraceni 1855, vol.21, p.360), shortly after the king's return from the east in 1252. Master Roger died in July 1263 (Chereau 1862).

Nicolas Germinet was a doctor from Langres in France and appears to have been working for Louis IX in 1249 (Wickersheimer 1936 p.570). Since Louis was in Damietta at that time, it could be inferred that Nicolas might well have been there too. One of Nicholas' descendants gave a gift to Langres Cathedral which was recorded in the cathedral archives. The relevant section of the record reads, *'Bone Germinet, descendue de Nicolas Germinet, Langrois et medecin de saint Louis en 1249'* (Brocard 1877).

Pierre de Soissons was surgeon (*cirurgicus*) to King Louis and went with him on the crusade to Egypt in 1248. Pierre is referred to in a document written at Jaffa in August 1252 (Layettes 1875, vol.3, doc.4022, p.166; Wickersheimer 1936 p.662), where he was given an annual pension of twenty Parisian libras per year. Significantly, he was not given the title of 'master' as the king's physicians were which might suggest he was less highly educated. He is the first crusading doctor so far identified in the texts who was referred to specifically as a surgeon. Up until the middle of the thirteenth century it appears that many doctors would have performed all the tasks which were later to be divided between the physician and surgeon.

Jean was barber to King Louis and was referred to in 1261 (Chereau 1862; Wickersheimer 1936 p.344). In a royal *Etat de Maison* from this year *'Johannes, barberus'* was recorded as receiving six deniers pay per day. Despite being a poorly educated barber, he was still paid by fixed salary rather than fee for service as most barbers were (Hammond 1960). This compares with the pay of the royal surgeon Pierre de la Broce, mentioned in the same text, which was two sous. Jean is not specifically referred to on crusade to Egypt the decade before or to Tunis in 1270, but this record suggests he might have been in the King's

service at that time. It is known that many barbers did go to Egypt with Louis in 1248-52 as Jean of Joinville mentions their activities in the camp at Mansourah, cutting out the overgrown gums which had developed in the mouths of soldiers suffering with scurvy (John of Joinville 1955 p.100).

Two physicians known to have participated in the crusade of St. Louis in 1270 were master Dude de Laon and master Martin. Master Dude came from Laon in northern France and was *physicus* and cleric to Louis IX. He accompanied Louis to Tunis in north Africa on his last crusade in 1270-2 (Richard 1992 p.325). Dude treated Louis when he became unwell with dysentery and despite his best efforts, the king died along with large numbers of the army (De Vita Ludovici 1840 p.39; Wickersheimer 1936 p.123-4). Dude also had an assistant working with him named Master Roger, but it is not known for sure if Roger also went on the crusade or joined the royal court at a later date. This Roger was distinct from the physician Roger de Provins mentioned earlier, who had died in 1263. We first read of Master Roger in 1274, just after the crusade of Louis to Tunis. He is listed as a physician cleric in the household of King Phillip II 'le Hardi' (Jacquart 1981 p.476), who had accompanied his father Louis to north Africa. In 1285 he had to mortgage one of his medical books (a compendium of medical treatises) to Jehan le Cirier for twelve sous to pay for the rent on his house (Delisle 1896b p.518-40). The details of this arrangement were actually written in the book, now held in the Bibliotheque Nationale, Paris. Master Martin (*domini regis phisicus*) was another physician who accompanied Louis IX to Tunis in the summer of 1270 (Wickersheimer 1936 p.539). Martin is mentioned in a letter from Pierre de Conde to Mathieu de Vendome, dated Tunis 21st August 1270 (Delisle 1890 p.75; Brachet 1903 p.402).

Pierre de la Broce was one of three surgeons working for King Louis around the time of the 1270 crusade. Pierre had been *chirurgicus* to Louis from 1261, when he first arrived at court (Baudoin d'Avensnes 1855 p.180-1). At this point was paid a basic salary of two sous

per day plus clothing allowance and other benefits, but his increased by six deniers when the king was at court (Chereau 1862). He was married with a family, so clearly was not a cleric. Pierre was given the post of chamberlain in 1266 (Guillaume de Nangis 1840, p.494-5) and then went on crusade with the king to Tunis in 1270. After Louis died there he worked for his son Philippe III 'le Hardi', who was also present on the crusade. Pierre is mentioned in a document of Philippe III in Tunis dated September 1270 (Langlois 1887). Guillaume de Salu was also surgeon to Louis IX and later Philippe III. Manuscripts refer to his role in the royal court both in 1261, with his wages of two sous per day (Chereau 1862), and again in 1274 (Jacquart 1981 p.446). This suggests that he was in the service of the king in the intervening years and so there is a good chance that he would have been taken on the crusade of 1270 to Tunis in the royal entourage. Master Jean de Betisy was another of Louis IX surgeons and he came from Soissons, the hom town of the king's surgeon Pierre in the 1250's. Jean was referred to in the 1270's as *cyrurgien* to Louis among the list of people interviewed by the confessor of Queen Margaret when he wrote his history of the life of St. Louis (Le Confesseur de Marguerite, 1840, p.63). At that time he was apparently forty eight years old. Interestingly he is given the title of master (*mestre*) which was rare for surgeons at that time, suggesting a good education and high standing. Since we know he worked for Louis and then his son Philippe le Hardi at least until 1288 (Berthaud 1907) it is very likely that as a surgeon he would have been taken on the 1270 Tunis crusade.

English Practitioners

There were also a considerable number of English practitioners who participated in the crusades. Some may have trained at Oxford and Cambridge Universities, which appear to have started to teach medicine by the thirteenth century (Bullough 1961; Bullough 1962b; Getz

1995), while others went to European universities or spent a number of years as an apprentice to an established local practitioner. Gilbertus Anglicus (de Aquila) was perhaps the most famous English doctor from the time of the crusades (Talbot 1965 p.58-60). He was a cleric who had become physician to the king of England by 1207 (Monasticon Anglicanum 1830 p.1026). His most well known work is the *Compendium Medicine,* written about 1240 (Getz 1991) but he also wrote a Commentary on the *'De Urinis'* by Giles de Corbeil and the authorship of some other works attributed to him is possible (Russell 1936). The *Compendium Medicine* covers surgical topics such as the management of wounds, fractures and many operations along with medical topics such as fevers, venereal disease and dietetics (Handerson 1918). It is likely that Gilbertus Anglicus went to the Latin East at some stage as his *Compendium Medicine* includes mention of his treatment of Bertram, a son of Hugh of Jubail (Gibelet) in the county of Tripoli. Bertram suffered with an eye disease, and apparently Gilbertus cured him using an eye ointment when local Muslim and Syrian Christian doctors had been unable to help him (Gilbertus Anglicus 1510 fol.137a). It could be argued that Bertram may actually have come to Europe for treatment rather than Gilbertus travelling to the Latin East. If this was in fact the case, it must have happened somewhere in southern Europe with a port, such as Salerno or Montpellier. Unfortunately, it isn't known for sure where Gilbertus spent most of his life or if he ever went to Salerno or Montpellier. However, if Gilbertus did in fact travel to the Frankish states then perhaps the most likely time for him to have gone was with the large English contingent accompanying King Richard I on the Third Crusade in 1189-92. While more than one Hugh of Jubail is known, Hugh III lord of Jubail flourished between 1177-87 and survived the Battle of Hattin (Continuation of William of Tyre 1996 p.39,50) and so should have been alive at the time of the Third Crusade. It is quite possible that Gilbertus went in the service of either Hubert Walter, who was Bishop of Salisbury at the time, or Earl Robert III of Leicester. In 1205, once Hubert

Walter had become the Archbishop of Canterbury, records show that Gilbertus Anglicus was his physician (Index Britanniae 1902 p.9) so it is possible that Gilbertus was also in his service the decade before. Bishop Hubert landed at Tyre in 1189, survived the siege of Acre and stayed with the army until the truce with Saladin (Richard de Templo 1997 p.402). Hubert had soldiers under his command and there are records of their injury which would have needed medical attention, such as when the right hand of a certain Everard was cut off near Acre in August 1191 (Richard de Temple 1997 p.238). Earl Robert III of Leicester also went on the Third Crusade and was a close companion of King Richard I. A charter (witnessed by Hubert Walter) confirmed the receipt of one hundred shillings by Gilbertus from Robert of Leicester for his homage and service (Rotuli Chartarum 1837 vol.1(i),p.141) and magister Gilbertus was witness to some of the Earl's charters too (Documents of the Danelaw 1920 p.243). As Robert only became Earl in 1189 and he died in 1204, the charter must date from this period. Although Bishop Hubert and Robert of Leicester are mentioned many times in the chronicles of the Third Crusade, no mention of a doctor or other specific members of their entourages are recorded. However, since we know he worked for both these crusaders shortly after their return, the evidence for Gilbertus Anglicus' involvement in the east with at least one is promising. Gilbertus is thought to have died somewhere between 1235 and 1250.

Ralph Besace was another medical cleric in the service of Richard I (*phisicus regis Ricardi*) for whom there is independent evidence for his presence on the Third Crusade of 1189-92. Matthew Paris recounted how Master Ralph was an eye witness to Saladin's execution of nobles by decapitation (Matthew Paris, 1866 44(ii),p.37). Apparently Ralph had been sent to Saladin's camp by King Richard as an embassy to bargain for their release. A large number of Frankish captives were beheaded by Saladin around this time as he was furious about the mass beheadings of the population of Acre ordered by King Richard after its

capture by the armies the Third Crusade (Ibn Shaddad 2001 p.168-77). Master Ralph continued as the king's physician until Richard's death and later became canon of St. Paul's cathedral in London (Matthew Paris, 1880, vol.5 p.220-1; Talbot 1965 p.263).

Master John of Brideport (in Devon) was doctor to King Richard I of England at the time he went on the Third Crusade in 1189 (Talbot 1965 p.125-6). He is referred to as *medicii R.* in a document of 1190 concerning a payment for a robe (Great Roll of the Pipe 1925 p.3). He was still in royal service in June 1193 when Richard was organising his ransom following capture on the way back from the crusade. Master John was advising the queen regarding the choice of a new archbishop of Canterbury (Gervase of Canterbury 1879 vol.73(i),p.518). This role suggests that John was a cleric rather than a layman, further supported by the record of his death in 1215 in the Cartulary of Oseny Abbey (Cartulary of Oseney Abbey 1929 vol.1,p.246-7). John of Brideport is not actually referred to in any documents specifically stated to have been written in the Latin East but it seems likely that Richard would have taken his *medici* with him on a dangerous expedition such as this. Another possible member of the English forces of the Third Crusade was Joseph *medicus* (Talbot 1965 p.199). Joseph is thought to have been in the service of King Richard around 1190, although there is no specific mention of him on the crusade. In 1171-2 he was paid for spices and electuaries sent to the king while he was in Ireland (Great Roll of the Pipe 1894 p.86) which shows he was acting in a medical capacity for the king even then. In 1190 the king reimbursed the cost of clothing for Joseph (Great Roll of the Pipe 1844 p.18), suggesting continued service or at least favour. Master Malger was yet another medical cleric in the service of Richard I in the 1190's (Talbot 1965 p.206-7). He was later elected bishop of Worcester in 1199 despite being illegitimate, and died in 1212. Records of this unorthodox election describe Malger as *'Magister Malgerius, domini regis Ricardi medicus'* (Ralph de Diceto 1876,68(ii),p.168). It is not known for sure if he went on the crusade on 1189-92, but

it is quite possible and other authors have suggested it (Talbot 1965 p.206).

Master John of St. Albans was the English physician (*phisicus*) who treated King Phillip Augustus of France while ill during the siege of Acre in 1191 (Matthew Paris, 1866 44(ii),p.38). He is also known as Jean de Saint-Gilles and Johanne Anglicus (Talbot 1965 p.179). The chronicle known as *The Continuation of William of Tyre* mentions the treatment of Phillips double tertian fever during the siege. 'The doctors offered their advice and God gave him grace to recover from his illness' (Continuation of William of Tyre 1996 p.108-9). The reason that information on Master John's crusade was mentioned in the *Historia Minor* of Matthew Paris (a history of England) despite working for the French royal court was probably because that they were both clerics from the Abbey of St. Albans (Matthew Paris, 1866,44(ii),p.38). It has been suggested that Master John was on loan to Phillip from King Richard since John was English (Wickersheimer 1936 p.476). This seems very unlikely as the two kings Richard and Phillip hated each other intensely. In fact, they only agreed to go on crusade on the condition that they went together, since they did not trust the other to resist invading their countries if either of them had headed east alone. As it was, the English and French armies ended up fighting each other in Sicily when on route to the Latin East (Richard de Templo 1997 p.160-3). There is little chance Richard would have done anything to actually help Phillip and would have been more likely to send him poison than a doctor. It seems that Master John came into the service of King Phillip by a more conventional route. There is no evidence for his study at Oxford (Emden 1957, vol.3,p.1623), as has been suggested (Berthaud 1907), but he did appear to have attended university at Paris and then Montpellier, where he studied medicine (Berthaud 1907). It was from there that he became royal physician and Montpellier would have been a logical place for the king of France to look for his medical staff on account of its prestige. He was still in the service of King Philip in 1198 as he gave a house in Paris to the Jacobites for the use of pilgrims (Matthew Paris,

1866, 44(ii),p.66).

Two English *medici* are known to have participated on the Fifth Crusade in 1218. Master Roger was not only a *medicus* but also parson of Kippax in Yorkshire (Talbot 1965 p.307). He went on crusade to Egypt with John de Lascy, the Constable of Chester and witnessed a document of his at Damietta (Chartulary of St. John of Pontefract 1899 p.36-7). It is known that he returned home alive as he witnessed a number of other Pontefract charters, including one on 1239 (Chartulary of St. John of Pontefract 1899 p.277). Thomas was a *medicus* who travelled with the entourage of William the Earl of Arundel to Egypt in 1218-21 (Talbot 1965 p.330). The earl managed to survive the first two years of the ordeal, unlike much of the army, but then died in 1221. Thomas then succeeded in transporting William's corpse back home where it was buried, at Wymondham in Norfolk (Matthew Paris, 1876, vol.3, p.67; Gesta Abbatum 1867 p.275). There is no record of quite how he managed this, as the body would have to have been preserved to avoid its decomposition in the heat. However, medical texts available at the time (such as that of al-Razi) did sometimes include passages on how to preserve bodies after death to allow just such a journey (Levey 1970). When King Baldwin I died during an expedition to Egypt in 1118 his abdominal organs were removed and he was salted and embalmed with balsam and spices (Albert of Aachen bk12, ch28). However, by the time his body reached Jerusalem the corpse apparently smelt terrible. Likewise after Emperor Frederick of Germany drowned on crusade in Armenia in June 1190 he was embalmed so that the body could be taken to Antioch (Continuation of William of Tyre 1996 p.88). An alternative method popular in the thirteenth century was to boil the corpse so that the bones could be returned home while the soft tissues were buried at the place of death (Brown 1981). Thomas was clearly a cleric as he was made prior of Wymondham in 1224 (Monasticon Anglicanum 1821, vol.3 p.326). This may have been a show of gratitude for his efforts to return the earl's remains. Thomas himself eventually died

in 1248 (Matthew Paris, Luard, vol.6, 1882 p.278).

A master John of Brideport is recorded as having gone on crusade with the army of Prince Edward of England in 1270. This master John is distinct from the physician of the same name who was in the service of King Richard I in 1190. Back in 1258 we first hear of John of Brideport as the physician of William of Valence, the Earl of Pembroke and brother to King Henry III (Calendar of Patent Rolls 1908, p.623). On July 10th 1270 master John is included in a list of English crusaders who were given protection for four years so they could go to the eastern Mediterranean with Prince Edward (Calendar of Patent Rolls, 1913, p.480; Talbot 1965 p.126). As the Earl of Pembroke is known to have gone on the crusade (Lloyd 1988 p.140) it seems that master John was probably still in his service and therefore would have been attached to him. John of Brideport was clearly a cleric as he had become parson of the church of Axeminster by April 1277 (Calendar of Patent Rolls, 1901, p.200). Master John died in February 1293 (Emden, vol.1, p.264). Another doctor named master Robert de Murisien was also included in the list of crusaders with John of Brideport (Calendar of Patent Rolls, 1913, p.480). Robert was referred to as Prince Edwards's physician in 1265 and also parson in South Kelsey Church, near Lincoln (Talbot 1965 p.289). Master William Fiscamp is a possible candidate for participation in the crusade of Prince Edward in 1270. He was known to have been the King Henry III's physician in 1263 as he was mentioned in a document of August 22nd (Calendar of Patent Rolls, 1910, p.276; Talbot 1965 p.393-4). In September 1271 he was still in royal service and he was granted protection for one year (Calendar of Patent Rolls, 1913, p.576). However, this protection does not specifically refer to his participation on crusade, as was the case for masters Robert de Murisien and John of Brideport, nor is master William mentioned on the list of crusaders with them. It is not clear if he also accompanied Prince Edward but the decision to take him was not made at the same time as the document mentioning these two other doctors, or whether he stayed in England to

look after the king.

Two English surgeons are of interest at the time of Prince Edward's crusade on 1270. Hugo Sauvage (*cyrugicus*) is listed among crusaders heading east with Prince Edward (Röhricht 1881). He had been in the family service of King Henry III and Eleanor of Provence and appears to have been seconded to Edward for the crusade (Lloyd 1988 appendix 4). Hugo is the only English doctor specifically referred to as a surgeon (as opposed to a *medicus*) to have been confidently identified so far as having gone on crusade. It is likely that he would have treated Edward for the stab wounds he received during the assassination attempt of 1272 in Acre (Templar of Tyre 1887 p.201). Master Simon de Preston was another surgeon who was also in the royal court at the time of Edward's 1270 crusade (Talbot 1965 p.324-5). In July 1268 he is mentioned as the king's surgeon when petitioning on behalf of a friend (Calendar of Patent Rolls, 1913, p.249). In 1275 he was clearly still alive as there is record of a William Cok of Tikehull owing him money (Calendar of Close Rolls, 1900, p.247). Simon in another interesting case where he has the prestigious title of master despite being a surgeon, which is contrary to the widely held view that medieval surgeons did not have a university education. As with the case of William Fiscamp, it is not clear if master Simon went east with Prince Edward or stayed with King Henry.

Italian Practitioners

Among the Italian doctors who went on crusade, perhaps the most famous was master Hugo of Lucca. His fame results from the surgical text of Theodorich Borgognoni (c.1205-1298), the Bishop of Cervia (Del Gaizo 1894). Theodorich was one of Hugo's pupils and he repeatedly credits Hugo with the knowledge presented in the *Chirurgia.* In his introduction Theodorich mentioned that the text was written 'according to the system of medicine of the

excellent Hugo of Lucca, a most expert man in the aforementioned science' (Theodorich Borgognoni, 1955, vol.1, p.1). Hugo was born around 1160 and between 1214 and 1219 is known to have been under contract with the city of Bologna to accompany the army in the field (De Claris Archigymnasii 1896, vol.2, p.14, doc 3; Sistrunk 1993). Hugo's contract of October 1214, paying him six hundred Bolognese lire per year, appears to have been the earliest undisputed example in medieval Italy where a doctor was hired long term by a city to treat its citizens (Nutton 1979). It is quite remarkable that a man of his age (about sixty) should remain in active military service at a time when he was well past the average life expectancy (Shahar 1993). It is known that he went with the Bolognese troops on the Fifth Crusade, to Egypt in 1218-21 (see Oliver of Paderborn 1948; Chronicle of Reims 1939). Hugo was witness to a document written at Damietta in 1220 where he is referred to as *domino Hugone Medico de Luca* (De Claris Archigymnasii, 1896, vol.2, p.532). It is likely that the practical tips on the surgical management of weapon injuries included in Theodorich's *Chirurgia* resulted at least in part from the experience Hugo gained when treating the injuries of the Bolognese soldiers. Hugo of Lucca is thought to have died in 1257 (Vedrani 1921, vol.1(2) p.312-20), aged well over ninety years old.

Master Roberto was another *medicus* attached to the Bolognese troops in Egypt. He is mentioned in many documents written at Damietta, especially in the summer of 1220 (Annali Bolognesi 1789, pp.431-3, 442-3, 447-8). He was to be paid fifty bezants (gold coins) in the first year of service and one hundred bezants per year from then on. It is probable that he knew Hugo as they were both from Lucca, both contracted with the Bolognese troops at Damietta and sometimes both mentioned in the same documents (Studien zur Gescichte 1891 p.70, no.47).

Master Constantin was born at Labour near Scala, in the district of Salerno. He is known to have migrated to the Latin East because he became *physicus* to Jean of Brienne,

while he was king of Jerusalem. John had married Queen Mary of Jerusalem in 1210 and ruled from until 1225, the period from 1212 being as regent for his daughter Isabel since Mary had died. Constantin later moved north to join the service of the Emperor of Byzantium. *Magister Constantinus* died on 25 August 1250 and was buried at the church of Saint-Jean-en-Valee in France (Cartulaire de Notre Dame 1865, vol.3 p.160).

Emfred (Aufredus) de Novo Castro was the doctor to Robert of Artois, the brother of King Louis IX of France. It is presumed from his surname that he may have originated from Italy. Emfred is thought to have accompanied Robert on the Seventh Crusade (Chereau 1862) where the nobleman died in the Battle of Mansourah in Egypt. However, the original source for this assertion remains unidentified (Wickersheimer 1951).

Stephen of Pisa moved to Antioch in the early years of the Frankish states and became involved with the school of manuscript translation which developed there. Master Stephen himself described himself as a philosopher rather than a doctor, but clearly included medical knowledge as integral to the study of philosophy. It is thought that he was treasurer of the Benedictine monastery of St. Paul in Antioch (Hunt 1950) His most famous medical translation while at Antioch was the *Regalis Dispositio* (The Royal Arrangement) in 1127, which was a Latin translation of the tenth century Arabic surgical text *kitab al-malaki* by al-Majusi. He also wrote a work on astronomy known as the *Liber Mamonis* (Burnett 2000).

A further interesting case is that of Galvano de Levanto, a Genoese doctor who described himself as a *medicus*. He was in the service of Pope Boniface VIII at the end of the thirteenth century (Leclerq 1965) and in response to the near complete loss of the mainland Frankish states in 1291 he wrote a proposal for a military expedition to retake the region. This was entitled *Liber Sancti Passagii Christicolarum Contra Saracenos Pro Recuperatione Terra Sancte* and was dedicated to the French king Philippe le Bel in 1295 (Galvano de Levanto 1898). It is not clear if he ever actually went to the Latin East or if he came up with

this plan from talking to others who had recently fled from there. As it happens his work was in vain as there was no major crusade to the eastern Mediterranean from that time onwards. Another Italian doctor who wrote with a view to subsequent crusades was Guido de Vigevano. He composed a work for King Philippe VI of France in 1335 entitled *Texaurus regis Franciae acquisitonis Terrae Sanctae de ultra mare necnon sanitatis corporis*. This included advice on how an 'ageing' crusader, such as the forty two year old king, might stay healthy on the expedition (Wickersheimer 1951; Samaran 1981; Leopold 2000).

Other European Practitioners

Other areas of Europe are not so well represented in the manuscripts with regards to evidence for crusading medical practitioners. The only Hungarian doctor so far identified is Alexander. He was a *physicus* mentioned in a Hungarian list of crusaders in the *Transilvaniae Praepositus* (Studien zur Geschichte 1891 p.80). According to the *Historia Salonitana* of Thomas Spalatensis, he arrived at Damietta in 1217 (Testimonia Minora 1882, p.231) but it is not clear if he survived the expedition.

Few Spanish doctors appear to have taken part in the crusades to the eastern Mediterranean, as they were involved with their own war, against the Muslims who held the southern part of the Iberian peninsula. However, one Catalan who did travel east was Ramon Lull. He was born in Palma, Majorca around 1232-5 and became a Franciscan monk. He spent much of his life preaching and writing on religious philosophy, producing over three hundred works. There is no evidence that he ever treated a patient and he was never referred to as a *medicus* or *physicus*. However, he was sometimes given the title *magister* and he did spend time at the medical centre of Montpellier, subsequently writing texts on medicine, hygiene and physiology. His works include *Liber Principiorum Medicinae*, *Ars Compendiosa*

Medicinae, *Liber de Regionibus Sanitatis et Infirmitatis, Liber Medicinae Magnae, Ars Operativa Medica,* and *Liber de Modo Applicandi Novam Logicam ad Scientiam Iuris et Medicine* (Anon. Hist Litt 1885; Delisle 1896a p.342-55). Although many treatises on alchemy have been attributed to him to gain credibility, he appears to have been rescued from these associations during the twentieth century (Singer 1928) He travelled extensively throughout Europe and when he heard the rumour that the Tartars has defeated the Muslims in battle and were allowing free access to pilgrims to visit the Holy Places, he went east. He stayed in Cyprus in 1300 while it was the last of the Frankish lands left in Christian hands, lodging with the Templars. There he learnt that the Tartars had not overrun the mainland as he had hoped. However, he did travel to the Christian kingdom of Armenia in 1301 and may then have taken the overland pilgrimage route to the Holy Places. He was back in Majorca again by 1302. In total he made three famous trips to Bugia and Tunis in north Africa to preach, in an attempt to convert the Muslims there (Acta Aragonensia 1908, 2, p.879-901). Initially he was just thrown out of these cities but on the third occasion, in 1315, one version has it that he was stoned to death (Hillgarth, 1971; Peers, 1929).

A significant number of Latin doctors are known solely as they were witnesses to legal documents drawn up in the Latin East. Often their country of origin is not obvious from the document and it seems unwise to speculate unless more evidence comes to light. They were educated *magistri*, which was probably why they were used in such a legal capacity. In 1195 magister Bernardus *medicus* witnessed a document written in Cyprus on 29 September (Regesta Regni 1893 p.193 doc.723). Both magister Lambertus *medicus* and magister Adjutus *medicus* were signatories to a document of 12 October 1200 written in Acre at the headquarters of the Order of St. Mary Latina (Regesta Regni 1893 p.206 doc.775). Master Lambert is again mentioned in 1207, along with magister Guillelmus *medicus*, in a document from Acre dated 18 December (Regesta Regni 1893 p.221 doc.824). This suggests Lambert

had been in Acre for a number of years and may have settled in the Latin East. Magister Matthaeus *physicus* was signatory to a document from Acre drawn up in April 30 1242 (Regesta Regni 1893 p.288 doc.1106) while magister Johannes *medicus* witnessed a document written in the Order of St. John in Acre on 20 August 1244 (Regesta Regni 1893 p.299 doc.1122). Later still, in 1279 a magister Rollandus *medicus* is the subject of a short document (Regesta Regni 1893 p.374 doc.1434) written on 30 October at *Laodicea* (Latakiya) in the Principality of Antioch. These seven doctors highlight the legal function apparently performed by university trained medical masters in the Latin East (Brundage 1993).

Robertus *medicus* was a Latin doctor who lived long term in the Latin East. He is known from the records of his purchase of a house in Jerusalem for eighty bezants in 1137 (Delaville le Roulx 1883 p.73-4) and he is involved in further property dealings in 1167 (Regesta Regni 1893 p.112 doc.430-1). It has been suggested (Wickersheimer 1951) that he may have been a *poulain*, meaning he had one Frankish parent from Europe and the other was a local Syrian Christian. Regardless of whether he was actually born in the Frankish states, perhaps as a *poulain,* or whether he was a European who decided to settle, his name shows he was clearly from Latin stock rather than one of the indigenous population. A similar example can be found in Antioch dating from 1137, where a Willelmus *medicus* is also dealing in property (Cartulaire du Saint Sepulchre 1984 p.174-5). Clearly someone passing through on a crusade would rent rather than buying property, so this suggests he was a Frankish settler.

Non Frankish Practitioners

While the majority of medical practitioners for whom we have evidence of their presence in the crusades were from Europe, there were also a considerable number of doctors who were indigenous to the eastern Mediterranean and other non-Europeans also passed

through the Frankish states. These came from all cultural and religious groups and the practice of medicine in the Latin East was not restricted to Christians. While some of the newly arrived crusaders continued to use the Frankish doctors who came with them from Europe, others seem to have been keen to make use of these new practitioners. William of Tyre describes this in his history of the kingdom and also shows how suspicious he was of the local doctors. 'Our eastern princes, through the influence of their women, scorn the medicines and practice of our Latin physicians and believe only in the Jews, Samaritans, Syrians and Saracens. Most recklessly they put themselves under the care of such practitioners and trust their lives to people who are ignorant of the science of medicine' (William of Tyre 1943 vol.2, p.292). When King Amaury of Jerusalem became ill with dysentery in 1174, he asked first asked the advice of 'physicians from the Greek, Syrian and other nations' before turning to his own Frankish countrymen, and they were only consulted when the first group would not give him the purgative treatment he asked for (William of Tyre 1943 vol.2, p. 395). This enthusiasm seen in Frankish settlers for indigenous doctors who spoke and dressed differently was a well known phenomenon and might not necessarily imply that the locals were any better than those from Europe. Isaac Israeli in his Fifty Admonitions to Physicians wrote in tenth century Egypt how, 'if a physician but comes from a distant land and speaks in a foreign tongue, not understood, the multitude will think him enlightened and gather unto him and take counsel from him' (Bar-Sela 1962).

The laws of the kingdom of Jerusalem dating from the 1240's, the *Assises de la Cour des Bourgeois*, included sections on the licensing of doctors prior to their practicing in Frankish towns (Assises de Jerusalem 1843 vol.2, p.169). 'No foreign doctor, that is one coming from across the sea [Europe] or pagan lands should practice as a urine doctor until he has been examined by other doctors, the best in the land, in the presence of the bishop of the place.' The choice of words used show that they allowed for doctors from different cultural

backgrounds to practice in the Frankish states so long as they could demonstrate sound medical knowledge to the assessing board. Similarly, the regulations regarding the hiring of physicians and surgeons to work in the Hospital of St. John in twelfth century Jerusalem include two versions on an oath, presumably to allow doctors who were not Christian to work there (Edgington 1998). Interestingly, a decree of the Frankish church of Nicosia in Cyprus was passed around 1250 which forbade Christians there from employing the services of Muslim and Jewish physicians (Sacrorum Conciliorum 1784 vol.26, col.314, canon 14). This strongly suggests that up to that time doctors from these groups were regularly used by the Frankish population, or the law would not have needed to be introduced. It is not clear if the decree resulted from a particular case of medical negligence, from the prejudice of new arrivals from Europe or perhaps squabbling between doctors from the different cultural groups on the island. However, it does sound surprisingly similar to the views of William of Tyre the century before. The ruling would not, obviously, have restricted access to eastern Christian doctors.

Practitioners indigenous to the eastern Mediterranean were paid in a similar manner to the newly arriving Europeans, discussed earlier. Many of these intermittently worked in the Frankish states and in neighbouring Muslim lands, depending on the circumstances. The best known were paid a regular fee for entering the service of the noble and wealthy and some of these became immensely well off (Jadon 1970a; Rosenthal 1978). While some were only allowed to treat their sponsor, others when not occupied with their contracted commitments could take on private fee for service cases as well. Doctors who worked in a hospital were usually paid a regular salary for this (Richards 1992). However, the majority of practitioners took on cases on an individual basis with a fee determined for each patient. Just as in Europe, it was thought honourable if a doctor treated the poor for free (Biesterfeld 1984), although quite what percentage of the total workload this might have comprised isn't clear.

There were no universities as such in the Frankish states, in the way there were in Europe, although there were clearly centres of learning such as Antioch and Tripoli (Usama ibn Munqidh 1929 p.237-8). This may have been in part due to the fact that few cities in the Frankish states had a high enough population to sustain a European style university (Bullough 1962a). This was not helped by the occasional massacres of the inhabitants of a town which put up resistance to an attacking army. Most of the indigenous practitioners of whom we have any information appear to have learnt their skills from attachment to a particular scholar or trainer. This could have taken place in the Frankish states or in neighbouring Islamic lands (Leiser 1983). There is very little information on any Franks born in the country who wished to study medicine. Presumably the alternatives would have been to study in their home region under a respected practitioner via the apprenticeship method or travel back to Europe for a university degree if they could afford this.

Maimonides (Abu 'Imram Musa Ibn Maimun) was the best known Jewish physician to have spend time in the Latin East, although it is unlikely that he practiced there. He was born on 30th March 1135 and raised in Cordova in Spain, but left with his family in 1148 on account of religious persecution from a fanatical sect, the Almohades. The family eventually settled in Fez, Morocco in 1158 but they left there in 1165 to move east. He arrived at Frankish Acre by ship before travelling south to Fustat in Egypt the same year. Over the years he gradually became well known for his clinical acumen and medical knowledge, eventually becoming the personal physician to Saladin (Jadon 1970a). His medical writings include *The Medical Aphorisms of Maimonides, A Commentary on the Aphorisms of Hippocrates, A Discourse on Asthma, The Extracts from Galen, Treatise on Haemorrhoids, Treatise on Sexual Intercourse, Treatise on Poisons and their Antidotes, Regimen of Health, Discourse on the Explanation of Fits* and *A Commentary on the Names of Drugs* (Bar-Sela 1964; Rosner 1981; Rosner 1996). These medical writings were firmly based on the works of

Galen, whom he greatly admired (Lieber 1979). It is now generally accepted that the past suggestions that King Richard I of England had asked Maimonides to be his personal physician while on the Third Crusade have no factual basis (Lewis 1964). Besides his medical activities he was a rabbi and wrote many religious and philosophical works. Maimonides died on 13th December 1204, aged sixty nine, and was buried at Tiberias in Galilee. Another Jewish doctor was Samuel the *miege*. He is referred to in the *Chronique du Templier de Tyr* as living in the city of Tyre in 1282-3 (Templar of Tyre 1887 p.214).

Eastern Christian groups were also represented among the local medical practitioners. The physician Abu Sa'id was with a Frankish army in 1138 in the county of Edessa. Barhebraeus wrote how the force apparently set out from Samosata and was ambushed by Muslim forces under the Lord of Mardin. A large part of the Frankish troops were killed and many others captured and carried off as slaves, and one of these was Abu Sa'id, whom he described as a minister, physician and philosopher (Barhebraeus 1932 vol.1,p.265). This is the earliest example so far identified of a named local practitioner working for the Franks. Abu Sulayman Dawud was an eastern Christian who did well treating the Franks in the Latin East. He was a native of Jerusalem who emigrated to Fatmid Egypt and became well known for his ability in both medicine and astrology (Cahen 1934). He returned to Jerusalem to work for King Amalric in the 1160's and treated his son Prince Baldwin, who had contracted leprosy (Mitchell 2000). One of Abu Sulayman's sons, al-Muhadhdhab Abu Sa'id, later took over from his father as Amalric's physician (Hillenbrand 1999). After the fall of Jerusalem to Saladin in 1187 Abu Sulayman returned to Egypt and stayed until his death.

Emperor Manuel I Comnenus of Byzantium (reigned 1143-1180) was one of the more surprising practitioners to have been identified (Leven 1991; Lascaratos 1996). It was standard education for the Byzantine elite to study some medicine and apparently Manuel gained much satisfaction from practicing his skill. This was despite the fact that following

Byzantine etiquette it would have been inappropriate for him to lower himself to actually treat anyone. Emperor Manuel was also renown for his sexual adventures at court as well as his fondness for western customs. In 1148 he personally treated Conrad III, king of Germany when he became ill on the Second Crusade and in 1159 he treated King Baldwin III of Jerusalem. This latter incident took place near Antioch when Baldwin fell from his horse while hunting and broke his arm. Even when the party had returned to Antioch and other doctors would certainly been present, 'he visited the king daily, himself renewing the poultices and healing ointments and then carefully replacing the bandages' (William of Tyre, 1943 vol.2. p.280).

Thabit was a doctor who is mentioned (Usama ibn Munqidh 1929 p.162) treating some Franks in the twelfth century chronicle of Usama ibn Munqidh. 'The Lord of al-Munaytirah wrote to my uncle asking him to dispatch a physician to treat certain sick persons among his people. My uncle sent him a Christian called Thabit. Thabit was absent just ten days when he returned. So we said to him, "How quickly you have healed your patients!" He said, "They brought me before a knight in whose leg an abscess had grown and a woman afflicted with imbecility. To the knight I applied a small poultice until the abscess opened and became well and the woman I put on a diet and made her humour wet. Then a Frankish doctor came to them and said, "This man knows nothing about treating them." He said to the knight, "Which would you prefer, living with one leg or dying with two?" The knight replied, "living with one leg." The doctor said, "bring me a strong knight and a sharp axe." A knight came with the axe and I was standing by them. Then the doctor laid the leg of the patient on a block of wood and bade the knight strike his leg with the axe and chop it off at one blow. Accordingly he struck it - while I was looking on - one blow, but the leg was not severed. He dealt another blow, upon which the marrow of the leg flowed out and the patient died on the spot. He then examined the woman and said, "this is a woman in whose head

there is a devil which has possessed her. Shave off her hair." Accordingly they shaved it off and the woman began once again to eat her ordinary diet - garlic and mustard. Her imbecility took a turn for the worse. The doctor then said, "the devil has penetrated through her head." He therefore took a razor, made a deep cruciform incision on it, peeled off the skin at the middle of the incision until the bone of the skull was exposed and rubbed it with salt. The woman also expired instantly. Thereupon I asked them whether my services were needed any longer and when they replied in the negative I returned home.' It has long been suggested that this passage shows that the abilities of Frankish doctors from Europe was inferior to the local indigenous practitioners (Woodings 1971; Munro 1933). However, recent reassessment has shown that this passage fits a classic style of Islamic writing for the period, where extreme examples that apparently contradict each other (didactic dichotomy) were used when describing a topic (Conrad 1999). As most authors omit the examples of exceptionally good outcomes following treatment by Frankish doctors which follow this passage, the result is the impression that Europeans were much worse than their Middle Eastern counterparts. In fact there is very little evidence to support that theory. Interestingly, the Sultan of Egypt at the time of the crusade of 1249 of King Louis IX also had amputation of his leg for an abscess (Klein-Franke 1986). Despite the fact that Ayyub never went near a Frankish physician, he died the day after the operation. Clearly death after amputation for infection was not uncommon and not restricted to those treated by Latin doctors.

Barac was the physician to the count of Tripoli around 1161. William of Tyre recounts (William of Tyre, 1943 vol.2, p.292) how that autumn he was temporarily loaned to King Baldwin III of Jerusalem for a consultation. 'The king was at Antioch. Desiring to take a physic before the approach of winter, as was his custom, he obtained certain pills from Barac, the physician of the count (of Tripoli), a part of which were to be taken at once and the rest after a short interval.'

The physician Muwaffaq al-Din Ya'qub b. Siqlab worked in both Frankish Jerusalem and Muslim Damascus in the second half of the twelfth century (Kohlberg 1988). He was a Melkite, meaning that he followed the Greek religious rite unlike the Jacobites and some other groups. His family came from Transjordan (to the east of the river) and they may well have been moved to Jerusalem in 1115 when King Baldwin I tried to increase to population of the city with local Christians. Ya'qub was born in 1165-6 and studied medicine in Jerusalem under another eastern Christian known today only as 'the Antioch Philosopher' (died 1184-5). When in Frankish lands he would wear the medical dress of the Franks, namely a head shawl, a small turban and a collared upper coat. On working in Muslim areas he had to change this for a full sleeve silk robe and a turban, more typical Damascene dress (Ibn Abi Usaybi'a 1988). Ya'qub's pupil Ibn Abi Usaybi'a wrote that he owned a number of medical books including Galen and would regularly quote long passages accurately. He tells us, 'Ya'qub was an excellent and successful medical practitioner; he would first make a thorough study of the disease and would then commence treatment in accordance with the rules mentioned by Galen, while also making use of his own experience. He carefully studied the symptoms of a disease. Whenever he visited a patient he inquired about every single symptom and complaint and considered every symptom which might point to the nature of the disease. His treatment was therefore unsurpassable' (Ibn Abi Usaybi'a 1988). Once Jerusalem had been lost to Saladin in 1187 he worked in a hospital in the city and then moved to Damascus. There he spent the rest of his career as physician to Sultan al-Mu'azzam until his death in 1228 (Ibn al-Qifti 1988).

Shaykh Abu Mansur was another eastern Christian physician who practiced in Jerusalem in the second half of the twelfth century, at the same time as Ya'qub b. Siqlab. Ibn Abi Usaybi'a tells us that they knew each other and practiced medicine together there (Ibn Abi Usaybi'a 1988). This may have been the same Abu Mansur who was later one of

Saladin's physicians (Jadon 1970b). Evidence for yet another eastern Christian doctor from the same date is found in the records of the Holy Sepulchre of Jerusalem. A document from 1160-87 shows that a *medicus* named Bulfarage lived in a house on the vicus Sanctus Martinus in Jerusalem (Cartulaire du Saint Sepulchre 1984 p.321). Bulfarage is likely to be a Frankish version of the Arabic name Abu'l-Faraj and he must have been a Christian doctor to be allowed to live in Jerusalem at that time.

Theodore of Antioch was one of the most well known physicians to be born in the Latin East. He was a Jacobite Christian thought to have been born in the 1190's and was brought up in Antioch, where he studied languages and philosophy (Kedar & Kohlberg 1995). His studies then took him to Mosul and then Baghdad, where he studied medicine until about 1220. After a time in the Lesser Armenian court he moved on to the court of Emperor Frederick II of Germany (Barhebraeus 1663 p.341). Master Theodore was active as a mathematician, philosopher, astrologer and also translated sections of Averoes and Aristotle into Latin. His only medical work was the *Epistola Theodori Philosophi Imperatorem Fridericum,* a treatise on the rules for the preservation of health for his patron (Sudhoff 1915). In February 1240 records show he was told to prepare syrups and violet sugar to be used by Emperor Frederick and others in the royal court (Historia Diplomatica, 1859, vol.5(2), p.750-1). Master Theodore had died by 1250 and there is evidence to suggest that he may have poisoned himself (Kedar & Kohlberg 1995).

Gregorius Bar-Hebraeus (Ibn al-'Ibri, Grighor Abu'l-Faraj) was a Jacobite doctor who was born in 1225-6 at Malatya (Greek Melitene), on the Euphrates (Barhebraeus 1932 vol.1,p.xv-xxxvi; Graf 1947; Segal 1971). He was son of a doctor called Aaron, hence the name 'son of a Hebrew', and first learnt medicine from him. With the Mongol invasions his family moved west to Frankish Antioch around 1243 and at the age of seventeen Gregory became a monk. He went south to Tripoli and studied rhetoric and medicine under a Nestorian scholar

named Ya'qub until 1246 (Barhebraeus 1872 col.668). After these studies the Jacobite Patriarch Ignatius II appointed Gregory the bishop of Gubbash and by 1253 he had become the Metropolitan of Aleppo. He wrote over thirty works on medicine, philosophy, astronomy, logic and religion and well as his historical epic 'The Chronography'. He translated a medical treatise on simple remedies by al-Ghafiki from Arabic to Syriac, and his Syriac translation of the Qanun of Ibn Sina was incomplete at the time of his death. He died in 1286 and his tomb is in the Church of the Mar Mattai Monastery, near Mosul.

Saliba Bar-Jacobi Vagii (Salibha Bar Ya'qub Wagih) was also a Jacobite doctor who lived in the mid thirteenth century. He was born in Edessa and studied medicine under Ya'qub in Frankish Tripoli, at the same time as Bar-Hebraeus (1243-6) (Barhebraeus 1872 col.668). When the Jacobite Patriarch Ignatius II sent Bar-Hebraeus off to be bishop of Gubos, he appointed Saliba to be Jacobite bishop of Frankish Acre (Barhebraeus 1932 vol.1,p.xvii). Despite various religious appointments in his life he was known to have continued to practice medicine. Ignatius was another Jacobite bishop who was a medical practitioner (Barhebraeus 1872 col.728-30). He was also bishop of Aleppo for a time and later retired to Tripoli to teach medicine there. These examples show a strong tradition for the study of medicine among the Jacobite religious community in the eastern Mediterranean at the time of the Frankish states. This has interesting parallels with the situation in Europe, where it was common for *physici* to be clerics as well. Despite high clerical office, some clearly continued to practice medicine and also write medical works.

Benvenutus Grapheus Hierosolmitanus (also known as Grassus/Crassus) was doctor specialising in diseases of the eye who is thought to have lived in the second half of the thirteenth century (Benvenutus Grassus 1996 p.4). His only known work was the *Ars Probatissima Oculorum* (Benvenutus of Jerusalem 1929) in which he provides clear descriptions of many of the ophthalmological diseases found around the Mediterranean at

that time (Feigenbaum 1955a and 1955b). The text is thought to have been popular as it was translated from Latin into Provençal, Italian, French and English (Benvenutus Grassus 1996). It was written in a very practical manner and was not particularly advanced with regards to medical theory. He appears to have been a rather vain and self confident man if the tone of his *Ars* was a true mirror of his character. Evidence in the text suggests that he was a Christian as it was written in Latin and includes many Christian terms, such as advising holding the cataract needle on the lens for as long as it takes to say four 'pater nosters' (Benvenutus of Jerusalem 1929 p.34). As many of his anecdotes and case studies are set in Italy he clearly spent a significant period of his career there. However, he also describes travelling widely, including to north Africa, and observing the local treatments for trachoma and other conditions. As well as the evidence for his Jerusalem origins from his name, he repeatedly used references to the east in the names of his treatments, such as the 'Jerusalemite collyrium' and 'Jerusalemite pills' and others are termed 'Alexandrine'. While it has been suggested that he might have used these terms as well as altering his name to gain credibility or prestige, recent biography of Benvenutus thinks this rather unlikely (Kedar 1995). For instance, Benvenutus recommended the use in his medicines of a high quality sugar termed *zucharum nabet*, a phrase used in the customs tariffs from Acre by the 1240's but apparently not in Europe until the fourteenth century (Kedar 1995).

Interpreting the Evidence

In the course of this study a considerable number of named European medical practitioners and medical authors have been identified as having participated in the crusades or spent time in the Frankish states. The majority of these were from France (ten definite, four probable and six possible), a significant number from England (eight definite, one

probable and four possible) some from Italy (five definite, two possible), others came from Spain or Hungary (two definite) and for others their country of origin is not known (nine definite). Sixteen were *physici*, fifteen were *medici*, six *cirurgici*, one a *miege* and one a *barber*, giving a total of thirty nine where their medical designation is known. Of this group, over half should theoretically have been able to treat trauma and weapon injuries, the rest being *physici* who did not perform the necessary 'hands on' procedures. However, as most of the records refer to the medical staff of kings or nobles, we should not uncritically assume that the same pattern would have been seen in the much larger group of medical practitioners in the Frankish states as a whole. There is very little record of the less educated *miege*, *cirurgicus* or *barberus* who worked freelance, unattached to a noble family. It is probably that there were far more of these than the highly educated masters who accompanied the nobles. Indeed, there are references to the activities of significant numbers of anonymous barbers in some of the later crusader chronicles (John of Joinville 1955 p.100). All those termed surgeons or barbers lived in the second half of the thirteenth century. The timing of the introduction of the words *cirurgicus* and *barberus* closely parallels the findings of other studies in Europe (Jacquart 1981 p.235; Talbot 1965 p.375). While the majority of the named *physici* and many *medici* were clerics, there was no evidence that any of the surgeons or barbers were. Our understanding of the permitted role of clerics in the practice of surgery by the church, outlined previously, is completely compatible with the findings here. No clergy in major orders are seen to have been actively involved with operative surgery after 1215 and they were typically *physici*. Those clerics who were *medici*, so may have practiced some surgical techniques, appear to have come from the secular clergy which was permitted. Interestingly two of the surgeons, Simon de Preston and Jean de Betisy, were described as master by their contemporaries so clearly some *cirurgici* had obtained a good education in medical theory as well as their practical skills. It is difficult to assess how the number of medical staff

accompanying a king or noble may have varied over time or between countries. If we only consider definite crusaders whose noble has been identified then the resulting group is probably too small such for statistical analysis. While at first glance it would appear that King Louis IX had by far the largest number of practitioners, if it is remembered that he went on two crusades then the number per crusade is halved. Furthermore, the bias inherent in the sources makes such comparison open to criticism. Sources written by authors from the same country as a particular king or noble are much more likely to mention the medical staff in detail than those written by a foreigner who would not know the entourage so well. In consequence those crusades where our main evidence comes from sources from one country will tend to underestimate the number of practitioners brought by other countries. As a result it is probably not helpful to perform such statistics until a much larger number of practitioners have been identified.

Some information has come to light on the incomes of a small proportion of practitioners discussed here. This may have been in part due to the fact that most of the individuals identified were clergy and so should not in theory have been earning money from their practice of medicine (Hammond 1960; Rawcliffe 1988). The Englishman master Gilbertus Anglicus was paid 100 shillings per year by the Earl of Leicester in the 1190's. The city of Bologna paid the *medici* master Hugo of Lucca six hundred Bolognese lire per year from 1214 and his colleague master Robertus of Lucca one hundred gold bezants per year in the 1220's. King Louis IX paid the *physicus* Hersende twelve deniers per day in 1250 and surgeon Pierre de Soissons was paid twenty Parisian libras per year in 1252. His *cyrurgici* Pierre de la Broce and Guillaume de Salu both received two sous per day in 1261, but Pierre received a further six deniers per day when the Louis was actually at court. Jean the *barbier* received just six deniers per day in 1261. It is often difficult to directly compare the earnings of doctors in the medieval period as the records may be for different coinage from different

areas at different times. It is known that the value of the same silver coin varied greatly depending on when and where it was struck, since different European regions tended to add varying amounts of cheaper metals (Pounds 1994). On the whole the later the date the less the contemporary value of the coin, as the debasement of the coinage became worse and worse. The most reliable currency appears to have been the gold bezant, from Byzantium, which was the coinage used to pay the Italian master Robertus in 1220. The coin was used in Italy more than northern Europe because of the Byzantine territories there. However, even the bezant's value had started to decline after the crusaders took Constantinople in 1204 and the gold content began to drop. Records for the other practitioners discussed in the table below were all in multiples of the *denier*, which makes comparison a little easier. The denier (*denarius*) was a silver coin which had been 95% pure at the time of Charlemagne. However, by 1250 the French denier was worth just a twentieth of that due to the addition of a variable amount of cheaper metals such as copper. As they were all paid by the king of France, they may well have all been paid in Parisian deniers and in fact the records for Hersende and Pierre de Soissons do specify this. Furthermore, they were all from within a ten year period, so this might limit the effect of the declining value due to debasement. A *sou* was the term for twelve deniers and the *libra* was twenty sous, so the pay in deniers per day can be calculated. There are a number of factors that limit the interpretation of these figures (Table 1). They do not include extras such clothing, regular meals, assistants, forage for horses and other items that were paid for by the court. Nor do they account for any other income they may have earned through private fee for service work once their royal duties were completed (Hammond 1960; Rawcliffe 1988), or other occupations such as law. It has been shown that some of the better educated *medici* and *physici* may have taken on some kind of legal role as well as the practice of medicine (Brundage 1993), being signatories on a number of Frankish documents or referred to as a *notarius*. In consequence we should not conclude from these figures that surgeons

Table 1: Salary Given by King Louis IX to his Crusading Medical Staff (1250-60)

	Deniers/day
Jean the barber (1261)*	6
Magistre Hersende, physicus (1250)	12
Pierre de Soissons, cirurgicus (1252)	13
Guillaume de Salu, cirurgicus (1261)*	24
Pierre de la Broce, cirurgicus (1261)	24
extra when king at court	6

*Probable participant but not actually mentioned in crusader documents.

necessarily earned more in total than physicians. However, this does highlight the lower pay of the barber compared with the physicians and surgeons, with Jean getting just a quarter of the salary given to the surgeons at the same date. Another surprise is why the surgeon Pierre de Soissons received just half the salary in 1251 that his colleagues Guillaume de Salu and Pierre de la Broce were to receive a decade later. Pierre de la Broce did not become chamberlain until 1266 so his extra post could not have been the reason. An alternative is that the service they were expected to provide to the royal court may have changed in those ten years, to increase the workload or limit other sources of income. It is also possible that the debasement of the value of the denier over this ten year period might be to blame rather than a true pay rise.

It also seems that there were a significant number of local doctors from different cultural groups within the Frankish states, including those born to Frankish parents, oriental

Christians, Jews and Muslims and seventeen known individuals have been discussed. Their cultural differences with Europe led to jealousy on the part of some Europeans but also respect by some nobles who chose them for their personal physicians. The earliest example so far identified of a local doctor working for the Franks is dated to 1138, but this does not necessarily mean that the Franks avoided them for an entire generation after their arrival. The states reacted to the situation with special adaptations to Christian laws and statutes so that these different groups could still be allowed to practice their art, even if there was some later legislation prohibiting the treatment of Christians by other religious groups. These laws covered medical licensing, clinical practice and also malpractice.

The evidence for the involvement of medical practitioners from Europe in successive crusades during the twelfth and thirteenth centuries gives an interesting glimpse on the structure, status, role and evolution of the medical profession at that time. There are also accounts of a thriving medical tradition among the indigenous inhabitants of lands which became the Frankish states, and the interaction between these individuals and the invading Europeans is quite intriguing.

Hospitals on the Battlefield and in the Towns

Some Frankish institutions were clearly hospitals as we understand them today, in the sense that they treated the sick by providing medical care to the standards of the period. Records of the treatments employed in some of these have been preserved, such as the hospitals run by the Order of St. John and the Order of the Temple. Occasionally there are documents written by people who actually stayed in such hospitals and these give an idea as to what it must have been like to have been a patient. However, for many institutions little or no detail on their function has been preserved in the records and other approaches have to be employed. One stumbling block is the terminology used to refer to a hospital in the medieval period. The medieval Latin word *hospitale* was sometimes used to refer to a hospital providing medical care but also for other residential charitable institutions such as the alms house, lodgings or hospice (Latham 1994). To make things more confusing, property of the Order of St. John (the Knights Hospitaller) was often referred to by the same word. However, this did not necessarily mean that there was a hospital providing medical care at each of their properties. The *domus infirmorum* or *firmaria* was a much less ambiguous medieval term and refers to an infirmary. The infirmary was a place where the sick were cared for, but it varied whether doctors were employed or if treatment was given just by a monk or someone with a rudimentary knowledge of a few medical treatments. Further information that may help differentiate the function of a hospitale include the choice of terms for those who stayed there. The *peregrinus* was a pilgrim or crusader but the term did not imply any ill health, so where no further details are given the use of this term might imply that a hospitale functioned as a guest house or hostel. A *pauper* was poor or impoverished and while care for these people shows philanthropy it does not imply any medical treatment. However, the

infirmus was weak, invalid or unwell while the *egrotativus* was sick (Latham 1994). Clearly the presence of these latter categories are more compatible with the functions of a hospital in the medical sense. It is these institutions that show evidence of providing medical care to the sick and injured in the Frankish states that are the focus of this chapter. While there is considerable evidence for the perceived role of religious pilgrimage sites in the healing of the sick in the Latin East (Pringle 1998, 2, p.52, 118, 220; Kedar 2001), saints relics fall outside the remit of this work. In consequence these pilgrimage destinations and also the charitable institutions for which there is as yet no evidence for medical treatment (such as the leprosaria of the Order of St. Lazarus and the various hostels and food distribution centres) have not been discussed. While some might argue that differentiating hospitalia by whether or not they provide conventional medical care may be irrelevant (Horden 1988), since the principal topic of this study is surgery it seems reasonable to concentrate on those Frankish hospitals where this took place.

In order to fully assess the network of hospitals in the Latin East, it is necessary to study the contemporary Frankish writings by pilgrims and professional chroniclers together with medieval maps and town plans, and to reconcile evidence from these sources with information derived from modern archaeological excavation. In this way it is possible to complement past studies of particular medical orders through discussion of newly excavated hospitals and recently discovered texts. This approach provides a relative comparison of the range of medical establishments that existed. This helps to shed further light on the services they provided for the population and their interaction with one another. It is possible to calculate the approximate patient capacity of these hospitals by assessing their excavation plans, bearing in mind our knowledge of the physical stature of the population of medieval Europe and of contemporary ideas on bed layout. The medical treatments used in these hospitals can also be compared with those known in Europe and the Near East at that time in

an attempt to assess the degree to which the various medical traditions of the medieval world might have influenced practice in the Latin East.

The hospital in medieval Europe, Byzantine Empire and Islamic World.

In order to study Frankish hospitals we should be aware of the state of comparable institutions in neighbouring cultures. This allows the Frankish hospital to be seen against the background of the standard practice of the day. While the fundamental need to look after the sick means that some factors will be noted across all regions, certain aspects of hospitals in western Europe, the Byzantine Empire and the Islamic world demonstrate interesting variation. It seems likely that these were a consequence of the differing religious beliefs, cultures and functional requirements of philanthropic institutions in the medieval period. Any Frankish practices for which no equivalent can be found in the contemporary hospitals in other cultures are clearly of particular interest as this might suggest innovation on the part of the Franks. Any Frankish practices which are not known in medieval Europe but are known in Islamic or Byzantine institutions might suggest adoption of new ideas by the Franks.

Byzantine hospitals remain a hotly debated topic as there are still large gaps in our knowledge. The period in question is over a thousand years long and there are significant lengths of time between the sources of evidence we do have, so that a certain amount of educated guesswork has been employed by some previous authors. Byzantine hospitals began to develop in the fourth century AD when caring institutions were established by Christian clergy. While some of these fed and clothed the poor or elderly, a proportion hired doctors to look after the sick (Allan 1990). In the following centuries a fair number of these *nosokomeia* / *xenones* were founded. Some were created in association with monasteries which were responsible for funding and in a number of cases nursing the sick, but in later

periods it became rare for monks to actually work on the wards. Some hospitals eventually severed their monastic connections, such as the Sampson and Markianos xenones (Miller 1997 p.135). From the seventh century staff were normally salaried laymen. While most of the xenones in the records appear to have been built in Constantinople, as early as the sixth century cities such as Alexandria, Antioch and Caesarea in Cappadocia possessed them. Early xenones frequently had a non-medical cleric as administrator but in later periods it became more usual for senior doctors themselves to take on this role. It is not known how representative the institutions of Constantinople were of the rest of the Byzantine Empire (Nutton 1986), but reasonable detail is known of hospitals such as the Mangana, Sampson and Pantokrator xenones. There is evidence for a form of separation of the patients by their diagnosis in some xenones from as early as the seventh century. The later Pantokrator typikon (c.1136) mentions a ward each for patients with fractures and wounds, ophthalmological and intestinal diseases, two wards for other illnesses and a ward for women. The Pantokrator employed a hierarchy of doctors, based on their experience, and sometimes surgeons specialising in certain problems such as hernias. Staff worked seven days per week with medical ward rounds daily in winter and twice daily in summer (Codellas 1942; Miller 1997 p.12-21; Gautier 1974). Doctors worked alternate months in the hospital, leaving a total of six months each year for private practice in the city. This made up for the very poor pay they received for their hospital work, similar to a labourer. It is presumed that the prestige of working in the xenon, with the resulting increase in private practice fees, explained this system. Other staff described by the twelfth century include pharmacists, medical attendants/nurses, surgical instrument sharpeners, priests, cooks, pallbearers and latrine cleaners. Byzantine hospitals do not appear to have been large, often with between ten and one hundred beds, with separate sections for men and women. The Pantokrator typikon mentions a female doctor and female nurses working on the female ward, but most doctors

were male (Miller 1997 p.141-66). At least by the eleventh century some patients with less serious illness were treated in the outpatient clinic. For the inpatients, religion played an important role and prayers for the soul of the founder, especially if an emperor, were regarded as important. Few xenones left a record of the diet fed to the patients, but the standard meals in the Pantokrator appear to have been vegetarian. However, patients were allowed to buy other foods if they desired. Treatments other than dietary modification included bloodletting, baths, medicines and surgery. Another area of debate is the clientele to be found in xenones / nosokomeia. The Pantokrator records suggest that only the acutely sick were cared for there and that the frail and terminally ill were elsewhere. In theory other institutions were available to help the poor and hungry (*xenodocheia*) or elderly (*gerokomeia*) who were not actually sick, although such terminology may not always have been that specific. However, it is unclear how representative the twelfth century Pantokrator evidence is for other institutions in Constantinople, other cities of the empire and for that matter other centuries (Conrad 2001). Medical education may potentially have been another role of the hospital in later centuries. In the Pantokrator xenon a doctor was employed to teach medicine to the children of other doctors on the staff and the most junior doctors were unsalaried, perhaps in a role equivalent to the modern medical student (Miller 1997 p.156). There are also a few medical manuscripts of collections of prescriptions that claim origin in hospitals as well as illustrated texts that may theoretically have been used for teaching in these xenones, suggesting the possibility of some kind of academic environment at least in the larger hospitals of medieval Constantinople (Bennett 1999).

The earliest hospitals in the Islamic Middle East are thought to have been founded in the 8th or 9th centuries AD. While it has often been stated that the Umayyad caliph al-Walid founded the first hospital in Damascus during his reign (705-15 AD), recent reassessment has shown no sound evidence for this (Conrad 1994). It seems that it was only from the end of

the 8th century that the foundation of true hospitals began, with the Abbasid caliph ar-Rashid establishing one in Baghdad around 790 (Dols 1987). Initial expansion in the 9th century was slow, but by the 12th century most major cities in the Middle East possessed at least one hospital and large cities such as Baghdad possessed several (Ibn Jubayr 1952 p.33-296). Some of these cities subsequently became part of the Frankish states and it is possible that they may have acted as an example for the invaders. For example, the eastern Christian practitioner Ibn Butlan supervised the construction of a hospital in Antioch in 1063, and this would have been functioning at the time the city fell in the First Crusade thirty five years later (Schacht 1937 p.65). A number of scholars have speculated as to why Islamic hospitals were founded. It is possible that with conversion to Islam the Christian population decreased, so that there were fewer monasteries to provide their traditional role of philanthropy and health care. Establishing hospitals was also seen as prestigious for rulers, so gaining popularity with their subjects (Dols 1987). There are many legends in Islamic historical texts about the early Islamic era and in consequence it is not at all clear if the inspiration came from the hospital (*nosokomeion*) developed by orthodox Christians in the Byzantine Empire or similar institutions of the Nestorian Christians in the Syriac speaking Sassanian Empire of Persia. Islamic hospitals were typically private, secular institutions funded originally by donations by rulers and rich benefactors with further income from land and properties held in trust (*waqf*) for the benefit of the hospital. They were usually run by a government official in conjunction with the senior medical staff. Doctors of all religions worked in the hospital setting but only male doctors are recorded as working there, never women. It was usual to provide separate buildings or wings for male and female patients, with nursing staff of the same sex as the sick. By the close of the crusades these areas were sometimes further divided to look after patients with similar conditions, as at the Mansuri hospital. In the largest hospitals such wards included those for patients with fevers, gastrointestinal illness,

ophthalmological conditions, mental illness, the wounded and those requiring surgery. Those most unwell were treated as inpatients while others were treated as outpatients. Some contemporary passages stated how hospitals were for the use of the rich and poor, locals and visitors. However, most people still paid for a doctor to treat them at home (Conrad 2001). One pre-crusade example is the 'Adudi hospital in Baghdad (Dunlop 1960). This was founded in 982 AD with twenty four medical practitioners, including physicians, oculists, surgeons and banisters. Medicine was taught to students there using manuscripts held in its library and many staff wrote medical texts themselves. Doctors were Muslim, Christian and Jewish and worked in the hospital some days and in the city other days. By 1068 twenty eight doctors were employed and in 1184 we know they visited the patients twice a week, every Monday and Thursday (Elgood 1951p.161-71; Ibn Jubayr 1952 p.234-5). At the time of the crusades the major cities in Asia Minor, Syria, Persia, Egypt and North Africa all possessed large and prestigious hospitals. The Nuri hospital in Damascus was founded by Nur al-Din b. Zangi in 1175, and according to al-Makrisi was paid with the ransom of an unnamed king of the Franks. The staff kept lists of all the patients names, along with the prescriptions for their drugs and other treatment they required. Senior doctors would visit the sick in the morning, visit their private patients in the afternoon and then return in the evening to lecture on medical subjects (Dunlop 1960; Ibn Jubayr 1952 p.296; Tabbaa 1997 fig.143). In Egypt Salah al-Din founded the Nasiri hospital in Cairo. By 1183 this comprised of large separate buildings for men, women and a secure block for mental health patients. The patients were reviewed morning and evening and given special foods and drugs to improve their health (Ibn Jubayr 1952 p.43-4). A hospital specifically for strangers and foreigners in Alexandria was described in 1183. Doctors were employed to care for them and the hospital even sent people out on visits to those sick who were 'too modest' to attend the hospital. These would describe the patient's condition to the doctors at the hospital and organise treatment based on

this advice (Ibn Jubayr 1952 p.33). The most prestigious establishment in medieval Egypt was the Mansuri hospital. It was founded in 1283 AD when a Fatmid palace was converted to care for the sick. The hospital could look after several thousand people and was funded by endowed property providing nearly one million dirhams per year. It comprised of four main buildings covering 10,000 square yards, with separate halls for patients with fevers, eye diseases, diarrhoea, surgical conditions and mental illness. Facilities also included a medical library, lecture room and pharmacy (Dunlop 1960; Ibn Jubayr 1952 p.43-4; Dols 1992 p.122). Mobile hospitals were also created, complimenting the fixed institutions found in the cities. This had the advantage that they could intermittently visit areas that had insufficient population to justify a normal hospital, but they could also cater for the sick in situations where the patients were themselves mobile, such as an army (Elgood 1951 p.174-6). In 942 AD a mobile hospital was functioning from Baghdad, to treat those in outlying regions when epidemic disease occurred and visit the sick in prisons. In 1122 a field hospital was set up by Mustawfi 'Aziz al-Din of Baghdad. This accompanied the Seljuk Sultan Mahmud, transported on the backs of two hundred camels. It was staffed with doctors and nurses and carried all the medical instruments, drugs and tents required to service the army on the march (Levy 1929 p.212).

In medieval Europe the word for a hospital (hospitale) referred to a broader range of institutions than was the case in the Middle East at that time (Jones 1983). One group housed the chronic and incurable sick such as leprosy patients (in leprosaria), the blind, disabled or those otherwise unable to care for themselves. As these were not acutely unwell typically no medical care was felt necessary. Some hospitalia provided a retirement home for the frail as they grew older (alms houses), others housed and fed pilgrims and travellers overnight and only small proportion of hospitals actively treated the acutely sick (Carlin 1989; Prescott 1992 p.1-2). As discussed above, in the east these establishments were

sometimes referred to with distinct terms that allow a reasonable understanding of their differing functions (Jones 1983) but in Europe it is only by studying the documentary evidence for each particular hospitale that the true function can be ascertained. Up to the 11th century monastic infirmaries are thought to have been the primary source of medical care for the sick poor in England, France, Italy and Spain while the wealthy employed a doctor to attend them in their own home (Orme 1995 p.21-3; Skinner 1997; Brodman 1998). From the 11th century a number of hospitalia were founded, initially often still associated with monasteries but later they were established by rich merchants, guilds and lay fraternities (Gilchrist 1995 p.12; Rubin 1989). It has been argued that this change came about to enable a stricter way of life in the monasteries while benefiting the rich founders of these secular institutions as clergy and inmates were required to pray regularly for the benefactors' souls (Orme 1995 p.49). In England there were about 250 hospitalia by 1200 AD and roughly 500 by 1300 AD. Of around 1000 institutions founded in England during the entire medieval period, less than 10% were solely to care for the acutely sick (Carlin 1989; Gilchrist 1995 p.10). These hospitalia were typically staffed by secular clergy with a rule based on that of St. Augustine. Mass was said regularly and inmates would repeat sets of prayers throughout the day (Orme 1995 p.47-56; Bird 2001). They were funded by donations from the founder and other patrons, income from land, fees for long term entry and some even participated in banking and loans (Rubin 1989; Lorentzon 1992). They tended to be self governing institutions rather than members of an organised network. Although some of the crusader orders did establish large numbers of hospitalia along the pilgrimage routes in Europe (Riley-Smith 1967 p.40; Selwood 1999 p.50-6) most of these were hospices providing accommodation for pilgrims. There is limited evidence for the presence of medical staff or treatment for the sick in infirmaries of the Order of St. John but it remains unknown how much they may have changed local practice before the thirteenth century (Miller 1978;

Luttrell 1994). In England the Order of St. John founded twelve hospitalia for the general population and one for members of the order, the Order of St. Lazarus had around thirteen leprosaria and St. Thomas of Canterbury had just the one hospitale in London. Little is known of any actual medical care practiced in these institutions and they were certainly not direct copies of the infirmaries in their principal houses in the east. There is hardly any evidence for the activity of medical practitioners in any hospitalia earlier than the 14th or 15th centuries in England and Spain (Rawcliffe 1999; Brodman 1998 p.86-99). Ibn Jubayr commented on the presence of churches that cared for the Christian sick when he visited Sicily in 1185, but the only institutions that he described as following the model of Muslim hospitals were to be found in the Latin East, in Acre and Tyre (Ibn Jubayr 1952 p. 346). However, a number of institutions in France, the Netherlands, Italy and Germany were employing doctors by the 13th century (Agrimi 1998; Henderson 1989; Miller 1978; Skinner 1997). In contrast to the situation previously, we hear from an early thirteenth century medical student who watched cranial surgery performed at the hospital of the Holy Spirit in Montpellier (Demaitre 1975). Clearly medical intervention in hospitals had progressed by that time. In those hospitalia where inmates were disabled, frail or acutely sick it was widely believed that medicine for the soul was much more important than medicine for the body. In consequence, treatment of bodily disease was often regarded as of much less importance than prayer and may explain why we hear so little about doctors in the early hospitalia (Rawcliffe 1998; Rawcliffe 1999; Bird 2001).

It has been suggested that to study the institutional medical care of the sick in medieval Europe it is the monastic infirmary, not the hospitale, that should be under investigation (Gilchrist 1995 p.37). Those monasteries that just treated the sick of their own order might make a good comparison for the infirmaries of similar Frankish institutions such as the Order of the Temple, while monastic infirmaries that treated the public might provide

good comparisons for the more open orders of St. John, St. Thomas of Canterbury and the Teutonic Order. Infirmary halls usually followed a design of 4-16 bays in England but tended to be larger in mainland Europe. In those available to the public it was normal to separate men from women, either by inserting a partition down the middle of the hall or by having two separate floors or buildings. The chapel was typically at the east end of the hall or, less commonly, half way down one side and this was also divided into two by a partition. In France there was less distinction between the hall and chapel than in England (Gilchrist 1995 p.17-21; Prescott 1992 p.7-12). There is some archaeological evidence for the practice of medicine in these infirmaries (Gilchrist 1995 p.32-6). Fragments of urine flasks have been recovered from the 14th century infirmary of St. Mary Spital in London (Thomas 1997) while a pharmacy jar with remains of an ointment containing poppy, cannabis, myrrh and rose was excavated at the medieval hospital of Soutra in Scotland (Moffat 1989). One useful comparison with the Frankish orders is the infirmary of the Benedictine Abbey of Westminster in England, as there are good records from 1100 onwards (Harvey 1993). This functioned just to care for those monks from the abbey who became unwell, not for the sick in the general population. At this institution the infirmary was a hall which extended west from the chapel. Tapestries and hangings were on the walls and the floor was covered with rushes. Several fires kept the sick warm and the beds had mattresses stuffed with either straw or feathers. Beds were arranged in two isles, with space between for the infirmarian and his servants to perform their tasks. The infirmarian did have some basic medical knowledge but was not sent to university, as was the case for other monks who left to study topics such as theology. Some medicinal plants were grown in the abbey herb garden while others were purchased from nearby apothecaries. Doctors (medici) were hired to treat the sick in the infirmary, sometimes on a yearly contract and sometimes on a fee for service basis. Male and female surgeons were also employed and while their actual fees were high per operation, there

is some evidence that they were regarded with lower social status than the medici as they were not given ceremonial cloaks by the abbey. Surgical treatments recorded include manipulating fractured bones, operations on hernias, washing leg ulcers with white wine and giving enemas. Bloodletting was performed by a barber hired on an annual stipend. The actual procedure was performed outside the infirmary hall on account of the mess made if the blood was spilt. In the 13th century healthy monks were bled 7-8 times per year, followed by a strengthening diet for the next two days. By no means all the monks in the infirmary were acutely ill and a number of elderly and frail monks lived there long term. In 1297-8 only 40% of inpatients in the infirmary were actually taking any syrups or drugs, which might suggest that they were not regarded as severely ill. On average 40% of the monks were admitted to the infirmary as an inpatient at some time each year, although most were for a week or less.

The battlefield hospital in medieval Europe is another institution about which little is known. However, one useful source of information has been preserved in a work of Arnold of Villanova. This Spanish medical practitioner wrote two works for his patron King James II of Aragon. One of these was a conventional *Regimen Sanitatis* but the other was more original, the so called *Regimen Almarie* (McVaugh 1992). It was thought to have been written in 1310 as King James besieged the Muslim city of Almeria in Granada, Spain. This was the time when the Franks still held Cyprus but had just lost the mainland Frankish states. Master Arnold's text summarises the approach to military medicine as seen at the beginning of the fourteenth century as applied to one the the Spanish crusades. The *Regimen* starts with advice on where to locate an army camp and which areas of the camp might be the healthiest for the most important individuals to place their tents. 'An army should not pitch camp in marshy regions for a long period of time. Wherever the camp may be located, the king should reside away from the side from which the land wind is blowing off the mountains.' The water supply for a large number of people was always a problem as even if pure when the army

arrived it may not have remained so for long if human and animal waste was allowed to contaminate it. When first encountering a source of fresh water such as springs, they were to remove dead plants or logs before using it as drinking water. 'Make the same examination in cisterns and wells as in springs and always be careful to see whether there is a gummy or greasy mass at the bottom, and take it out. If you cannot make such an examination, then thoroughly moisten a fine white linen cloth in the water and fold it loosely; once folded and tied with a cord, suspend it in the sun or the air and when it had dried, unfold it. If stains appear in it, of whatever colour, the water is sure to be diseased, but if it is not stained it is healthy.' This is a very practical way of determining how clear the water was. If it was stained green or brown then algae, mud, animal dung or carcasses may have made the water unhealthy to drink. Once the hostilities had commenced then the wounded need special care, not only so they might recover to rejoin the fight but also as large numbers of wounded slowed an army down when on the march. Arnold gave his recommendations for how to treat the wounds and what diet to take to encourage healing. 'All the wounded should use powder of lesser poligony daily as follows, taking a spoonful of it with wine, fasting - or, if they are poor, with the aforesaid water; and when the wound has been cleansed let the powder be sprinkled on externally too. If someone is poisoned, by an arrow or something else, he should take, fasting, one spoonful of the following powder with aromatic wine or the above mentioned tisane: Rx one part of citron seed, three parts of hart's tongue fern and make a powder. Such patients can also be given cabbages with oil as food.' Those who managed to avoid injury were always in danger of contracting an infectious disease due to the poor sanitary conditions and the overcrowding in an army camp. This could kill as many as died in battle. Arnold recommended, 'so that the army may be preserved from epidemic, let pits be dug everywhere outside it's lines, like trenches, where animal wastes and bodies can be thrown; and when they are half full, cover them with earth.'

Care of the sick in the medieval Christian infirmary or battlefield tent followed the conventional pattern of spiritual care, nursing care and then medical care. Where medical care was available the doctor would assessed the patient to make a prognosis and if possible a diagnosis. For diseases thought due to humoural imbalance this was followed by treatment which traditionally commenced with the modification of diet, later complimented by drugs, baths and bloodletting if necessary and finally the use of surgery if the former techniques failed. Clearly in the case of trauma, on or off the battlefield, surgery was moved to the top of this list with the other techniques playing a supportive role to strengthen the patient.

Crusader Field Hospitals

The role of medical staff in maintaining the health of an army had been well understood since classical times (Nutton 1969; Jackson 1988) and they were just as essential during the medieval period. Crusader armies sustained many thousands of casualties during the twelfth and thirteenth centuries and rulers in command had to develop ways to cope with them on campaign. The wounded not only slowed down the army but also weakened its fighting strength and restoring the injured to fitness increased the likelihood of victory.

In the early years of the crusades there is no record of organised field hospitals although doctors did accompany the armies on the march (Edgington 1994). It seems the injured were usually taken to the nearest friendly town after a battle to be cared for there. At the battle of Tall Danith near Antioch on 14th August 1119 Walter the Chancellor mentioned how those wounded who were unable to walk or crawl off the battlefield were helped (Walter the Chancellor 1999 p.155). King Baldwin II came back to the battlefield the next day and, 'he ordered that both those wounded on the field and the dead to be brought from there and all around,' presumably to be given first aid and then return to Antioch with him to recover.

During the Third Crusade King Richard I of England had so many wounded and sick by January 1191 that they were slowing down the army and limiting its effectiveness. It is also possible that he was concerned for the health of his soldiers as the chronicles suggest. 'An enormous number of the sick would have died if it had not been for King Richard, because they could not take care of themselves and had no one to look after them. Prompted by his regard for divine mercy he took care of everyone, sending messengers all around to seek out those who were ill. In his goodness he gathered together those who were dying and when he had assembled them all he arranged from them to be brought with him to Ramle' (Richard de Templo 1997 p.285). If there was a public hospital in Ramle the records of this have not come to the attention of modern scholars, but it is likely that every town in the region would have had at least a hostel for pilgrim accommodation. We can only presume that the sick and injured were either cared for in the town hostel, unoccupied houses or tents. It is unknown whether they merely received food and shelter or whether there was formal medical care arranged. There were other occasions when no preparation could be made for casualties, as was the case for surprise attacks or small raids into enemy territory. A Frankish caravan taking supplies from Jaffa to King Richard I's army at Beit Nuba was ambushed by Muslim forces on 17 June 1192. Those who survived had to make their way to the camp as best they could. Records show that, 'they gently laid our wounded and fallen on horses and took them back to the army' (Richard de Templo 1997 p.332). On another occasion William Longspee attacked a Muslim caravan near Alexandria during the crusade to Egypt in 1250. Matthew Paris (Matthew Paris 1853 vol. 2 p.354) noted, 'he lost only one knight and eight retainers who were slain; some, however, were wounded, whom he brought back to be restored by medical aid.'

On occasion the slow pace at which the sick could move put both themselves and others at risk. In December 1191 the injured crusaders who were recovering in the city of

Jaffa were keen to rejoin the army of King Richard I as they were rumoured to be about to attack Jerusalem. Understandably, many were unable to walk and they were carried in the customary way. 'Those who had fallen sick at Jaffa were carried to the army on pallets and litters, hoping to advance to Jerusalem..... However, while the sick were being carried along like this the Turks rushed down on them, killing the bearers with the sick because they did not believe any of their enemies should be spared' (Richard de Templo 1997 p.279). This slow moving caravan must have been a easy target for passing enemy troops. Some commanders took care to provide transport for the inevitable casualties so that they did not slow the army down. We have good details of the preparations Emperor Frederick of Germany made for his crusade in 1189. With regards to the transport of the sick and wounded the *Itinerarium Peregrinorum et Gest Regis Ricardi* noted that, 'a great many wagons were constructed for sick travellers so that the infirm should not delay the healthy and the crowd of sick and destitute should not perish on the way' (Richard de Templo 1997 p.54).

There are some early examples when it is known that the wounded were treated while the army was on the march, rather then just sent to the nearest town. In January 1126, King Baldwin of Jerusalem was engaged in battle with Tughtegin near Mergisafar on the Plain of Medan. William of Tyre (William of Tyre 1943 vol. 2. p.29) recounts that, 'they sent the wounded back to the baggage train to receive care.' In the confusion of battle it must have been difficult to know exactly where to take the injured for medical care. In the Third Crusade we are told that Richard I of England had his banner hoisted up on a tall wooden pole. To allow it to be moved about with the army the pole was placed on a wooden platform on wheels. This was surrounded by a force of soldiers whose job it was to prevent it falling into enemy hands. It is recorded that 'the infirm and wounded are brought there to be cared for' (Richard de Templo 1997 p.237) while the battle raged on around them, protected by the

knights.

The first evidence for an actual field hospital in the crusader armies dates from the 1180's. A text written by an anonymous cleric about his experiences as a patient in the hospital of St. John in Jerusalem also recorded information regarding the medical facilities provided by the Order of St. John on the battlefield (Kedar 1998). He mentioned that those soldiers of the army who were wounded were attended to in mobile hospitals set up in tents of the order. Those who needed further treatment were transported to the Jerusalem hospital, or closer towns if necessary, using camels, horses and donkeys kept for this purpose. The four surgeons working for the hospital of St. John in Jerusalem at that time (Cartulaire General 1894-1906 vol.1 p.458 cart.690) are known to have been attached to this field hospital. Usama described the type of large tent used in crusader armies on the march (Usama ibn Munqidh 1929 p.116). The particular tent he saw was actually for use as a church by the patriarch, but it is plausible that a field hospital might be similar with the addition of beds or mattresses. The floor was covered with bulrushes and grass to prevent the ground becoming muddy in wet weather. Unfortunately many fleas and other insects lived in the floor covering, which caused a nuisance to those inside. In 1190 during the long siege of Acre by Christian forces in the Third Crusade merchants and sailors from the Baltic Sea, Bremen and Hamburg established an improvised field hospital made out of wood from dismantled ships and roofed with sail canvass (Prawer 1972a p.119; Mayer 1988 p.142; Sterns 1983). The fact that they had to break up ships to build this suggests that the troops had not brought a field hospital with them on the crusade but that circumstances had triggered the foundation. A similar field hospital was established by the English troops at the same siege. This was organised by a priest named William and dedicated to the martyr St. Thomas Becket (Ralph of Diceto 1876 vol 2. p.80-1).

Town Hospitals

It was principally the poor and pilgrims who tended to use those Frankish hospitals which were open to the public. The wealthy of the kingdom could hire the services of a doctor who would come to their own home or castle and was in a position to give his undivided attention to the well being of his client. When King Conrad of Jerusalem was stabbed by two of the Assassin sect in April 1192 at Tyre, he was carried to his own palace (Ambrose 1939 p.119) rather than to one of the towns hospitals as might happen today. Likewise, as a child in the 1160s Prince Baldwin, the son of King Amalric of Jerusalem, did not go to a hospital for treatment of his leprosy but had the physicians brought to him (Mitchell 2000). There are a few examples of nobility using the services of these hospitals and these were typically those from Europe without property or family in the kingdom on which to rely. Count Henry of Rodez made his will while in the hospital of St. John for the sick in Acre during October 1222 (Cartulaire General 1894-1906 vol.2 p.308-9 cart.1760). In 1190 Clarembaud, seigneur of Noyers, gave the Order of St. John at Tyre a gift of one hundred *sous* every year in gratitude for the care he received at the time he fell ill in the Holy Land (Cartulaire General 1894-1906 vol.1 p.571 cart.900). The poor inhabitants of the Frankish states certainly did not have the money to obtain the services of a personal physician. Pilgrims from Europe might not have been allowed to remain in their lodgings due to the risk of spreading disease to others in their dormitory. Members of these three groups might have stood a better chance of survival if cared for in one of the public hospitals.

Hospitals in the Latin East developed from a variety of sources, with origins in the Islamic Period or newly built during the Frankish occupation. Some were run by carers with purely religious motives while others involved a more calculated functional approach, by healing wounded soldiers to maintain the army up to strength. All the hospitals for which there is evidence of medical care were run by military orders and funding came from

pilgrim gifts and legacies as well as the profits from farming land owned by these orders. One possible reason for the range of different hospitals was the lingual diversity found between different areas of the Latin East. While the social and cultural dominance of the Franks made medieval French the verbal language of the Latin East (although much written correspondence was in Latin), different groups which formed up the original armies naturally spoke differently. In the kingdom of Jerusalem people tended to speak the dialect of northern and central France, in the county of Tripoli the language was often Provençal or Occitan, and in the principality of Antioch it was Norman (Prawer 1972a p.199). This was quite apart from the confusion added by those from England, Spain, Italy or Germany who used their native languages among themselves. Jacques de Vitry wrote (Jacques of Vitry 1971 p.56) that

> 'many of the chapels and smaller churches are maintained there by men of various languages. For there are Greeks, Bulgarians, Latins, Germans, Hungarians, Scots, Navarrese, Bretons, English, Franks, Rutherians, Bohemians, Georgians, Armenians, Jacobites, Syrians, Nestorians, Indians, Egyptians, Copts, Capheturici, Maronites and very many others.....'

The sick would naturally seek someone who spoke their own language or dialect at a time when complete clarity might be extremely beneficial to their health. This helps to explain the presence of hospitals run by the French, English and Germans in the same town.

The Order of Saint John (Knights Hospitaller)

In the second half of the eleventh century Amalfitan merchants refurbished the decaying monastery of St. Mary in Jerusalem, then under the tolerant control of the Fatmid Caliph al-Mustansir (reigned 1036-1094). Along with this they renovated the old hostel which had been dedicated to St. John the Baptist by the Byzantines in the fifth century

(Jacques de Vitry 1971 p.46; Luttrell 1997). They staffed the complex with Italian Benedictines who in return provided accommodation to Amalfitans on business or pilgrimage in the area. A convent of nuns was also founded to cater for women in the hostel of St. Mary Magdalene. The name of the first abbess was Agnes and the nuns wore an eight-pointed white cross on a red habit (Delaville 1904). A third hostel was then built for the benefit of non-Amalfitans and this was entrusted to lay brothers, whose counterparts were later to be the Knight's Hospitaller and in the words of Jacques de Vitry (Jacques of Vitry 1971 p.56), 'for distinction they wore white crosses on flowing black mantles'. This became a self-governing body by 1113, with the Levant now in Frankish hands, when it was recognised as such by Pope Pascal II in the bull *Pie Postulatio Voluntatis* dated 15 February (Cartulaire General 1894-1906 vol.1 p.29-30 cart.30). The order developed complexes in several other major cities at an early stage at such as at Acre, Antioch and Jaffa (Cartulaire General 1894-1906 vol.1 p.9 cart.5; p.21 cart.20), although the presence of a hospitale is not necessarily mentioned.

In a few years the hospitale of St. John in Jerusalem gained considerable fame through the caring activities of brother Gerard, Margaret of Sicily and others (Ludolf 1971 p.106; Barber 2000), so that gifts and legacies from pilgrims, crusaders and nobility enabled its expansion. After a battle with the Egyptians on the plain of Ascalon in September 1101 one tenth of the captured plunder was given to, 'the Hospital and Christ's poor' (Albert of Aachen bk7 ch70). Roger I, count of Sicily sent an envoy to the patriarch of Jerusalem in 1101 with a thousand gold bezants. These were to be divided equally between the the Holy Sepulchre, the king's army and 'the Hospital for the feeble and other sick'. Unfortunately the patriarch had kept the lot for his own personal use, as he had done with a number of other donations. With this evidence he was proved guilty of fraud and was deprived of his powers, while many of his staff were thrown into prison (Albert of Aachen bk7 ch62). Raymond de

Puy succeeded brother Gerard following his death (Cartulaire General 1894-1906 vol. 1 p.38-9 cart 46) in 1118 and became the first master of the Order of St. John. Some time between 1125 and 1153 he added a chapter to the original rule of Gerard (Cartulaire General 1894-1906 vol.1, p.62-8, cart.70; King 1934 p.20-8) concerning the care of the sick, which described a caring approach to the patients in a strongly religious setting (Sinclair 1978). This rule was an adaptation of the Rule of St. Augustine (Riley-Smith 1967 p.48.) as was so common in European hospitalia, rather than the Benedictine rule of the original founders. In article 16 of his rule it is written,

> 'in the obedience in which the master and the chapter of the hospital shall permit, when the sick man [*malade*] shall come here let him be received thus, let him partake of the Holy Sacrament first having confessed his sins to the priest, and afterwards let him be carried to bed, and there as if he were a Lord, each day before the brethren go to eat, let him be refreshed with food charitably according to the ability of the house.'

This confession of sins on arrival is fully in agreement with religious views at that time. In the slightly later Fourth Lateran Council of 1215 it was stated that, 'as sickness of the body may sometimes be the result of sin ..... we by this decree order and strictly command physicians of the body, when they are called to the sick, to warn and persuade them first of all to call in physicians of the soul so that after their spiritual health has been seen to they may respond better to the medicine for their bodies; for when the cause ceases so does the effect' (Decrees of the Ecumenical Councils 1990,vol.1,p.245). One Frankish pilgrim guide from 1128-37 used the terms xenodochium and nosokomeion to differentiate the functions of the hospital. 'The Greek word xenodochium translated into Latin is a refuge for travellers and poor people. Nosokomeion is the hospice which cares for the sick people taken into it from the squares and alleys' (Work on Geography 1988 p.200). A document of Roger of Sicily from 1136 (Cartulaire General 1894-1906 vol.1 p.100 cart.119) refers to those in the hospital at

Jerusalem as the poor and sick (*infirmis*) and Pope Innocent II mentioned the sick in the hospital between 1139-43 (Cartulaire General 1894-1906 vol.1 p.107 cart.130). Strictly speaking the word *infirmis* refers to the disabled and the weak, but the term sick is often used as these groups must have had a disease of some kind to incapacitate them, even if just arthritis or malnutrition. These are the first occasions that the sick are referred to, since before that time the hospitale was usually called the hospital for the poor. The first reference to those with an acute illness (*egroti*) is from 1175 when referring to the hospital of the order at Acre (Cartulaire General 1894-1906 vol.1 p.323 cart.471). However, there is still no reference to medical treatment by that time, just food and lodging in a strongly religious setting. John of Würzburg (John of Würzburg 1988 p.266) was present in Jerusalem around 1165, a few years after Raymond de Puy's chapter. John wrote,

> 'in various houses a great crowd of sick people is collected, some of them women and some men. They are cared for and every day fed at vast expense. The total number of persons at the time when I was present I learned from the servitors talking about it, and it was two thousand sick persons. Between night and day there were sometimes more than fifty corpses carried out, but again and again there were new people admitted. What more can I say! This house feeds so many human beings outside and within.'

Clearly he regarded the hospital to have been for sick people, rather than just poor and hungry people and this is supported by the fact that a significant number died each day (perhaps 1-5%). Even more interesting is that he describes that they were made well again at great expense. The could have merely meant that the food and bed provided by the order allowed many of the sick to cure themselves, but it might also be implying that doctors and were employed and medicines given. The dietary supplementation of the poor inhabitants of Jerusalem, distinct from the patients, would have been an effective form of preventative

medicine for the time. It is well known that the undernourished are more susceptible to many diseases (Chandra 1986; Gross 1980; Watson 1984). Even apart from the specific nutritional deficiency syndromes, insufficient intake of energy, certain vitamins and minerals has been associated with impaired immune function and the reduced ability to resist infection. Maintenance of an adequate diet for the poor would be expected to reduce the numbers subsequently requiring the services of the hospital. Of course, the order would have been unlikely to see it that way and probably just thought of it as another way to express their charity.

Theodorich (Theodorich 1988 p.287), a pilgrim who saw the hospital in 1169, added that,

> 'I would not trust anyone to believe it if I had not seen with my own eyes how splendidly it is adorned with buildings with many rooms and bunks and other things poor people and the weak and the sick can use. What a rich place this is and how excellently it spends the money for the relief of the poor and how diligent in its care from beggars. Going through the Palaces we could in no way judge the number of people who lay there, but we saw a thousand beds.'

The estimates of one to two thousand patients by Theodorich and John of Würzburg were enormous numbers for a Frankish hospital at that time. The figure immediately brings the response that this must have been medieval exaggeration (Miller 1978; Luttrell 1994), but it is known that the building was very large. After the battle of Montgisard in 1177, 750 wounded were taken to the Jerusalem hospital despite the fact that there were said to already be 900 patients in it at the time (Beitrage 1874 p.128). A study of patient capacity in this hospital is outlined in a later section, to see if medieval exaggeration can indeed be blamed.

The statutes of Master Roger des Moulins (1177-87) incorporated a number of decrees (Cartulaire General 1894-1906 vol.1 p.425-9 cart.627) at the Chapter-General of

March 1182. He records 'that for the sick in the hospital there should be engaged four wise doctors [*mieges/medici*] who are qualified to examine urine and to diagnose different diseases and are able to administer appropriate medicines.' The beds of the sick were to be as long and wide as was most convenient to lie on, but exact measurements were not given. Each person was to have a sheepskin cloak, boots and cap of wool for going to the toilets. Interestingly the toilets at the complex of St. John in Acre have now been excavated and it has been shown that many of those who used the latrines were infested with parasitic intestinal worms such as the roundworm, whipworm and fish tapeworm (Mitchell & Stern 2001). Brethren of the order were to guard and watch the sick poor day and night, serving them 'with enthusiasm and devotion as if they were their Lords'. Other decrees included the use of cradles for babies born in that part of the hospital reserved for women, so that they should not be disturbed by their mother's restlessness. Nine sergeants of the order, not of noble birth like the knights, were assigned to each ward to wash feet, change sheets, give food to the weak and be at the service of the sick. Also recorded were details of the tribute Hospitaller priories outside the area had to send for the benefit of the sick at the hospital in Jerusalem. The Frankish bailiff of Tiberias and the prior of Tripoli each had to send two quintals of sugar for syrups and medicines for the sick, as these areas had considerable sugar cane plantations. From Europe the priors of France and St. Gilles each had to send one hundred dyed sheets to replace those worn out with use, while the Frankish bailiff of Antioch sent two thousand ells of cotton cloth for coverlets. The prior of Constantinople was required to send two hundred felts for the sick, while the priories of Italy, Pisa and Venice each had to contribute two thousand ells of coarse twilled fabric of diverse colours, to keep the patients warm.

Two years later, in 1184, Pope Lucius III mentions the presence of four *medici* and the same number of *chirurgici* at work in the hospital for sick poor (Cartulaire General 1894-1906 vol.1 p.458 cart.690). Not only did this show an increase in the number of doctors in

the *Palais des Malades* to eight, but this also shows a perceived need for the treatment of injuries and other surgical conditions. It has been suggested that the surgeons were under worked compared with the general doctors, particularly in times of relative peace (Edgington 1999). However, the injuries from falls and other accidents would still have taken place, elective surgery was still needed for chronic surgical conditions such as abscesses, hernias and bladder stones and it should not be forgotten that medieval surgeons also treated a wide range of pathology seen today by physicians, such as ascites and a number of skin and venereal diseases (Theodorich Borgognoni 1955-60). It is unlikely that the order would have spent money on employing unnecessary doctors as more could always have been contracted from the community in times of need, such as after battles. It seems more logical to interpret this text to show that there must have been a need for these four surgeons in the hospital working at a typical workload.

A manuscript containing a valuable set of regulations of the order that were not published in Delaville le Roulx's *cartulaire* has recently come to light (Edgington 1998; Edgington 1999). They are dated to between 1177 and 1183 and were entitled, 'Concerning food for the sick, doctors and the organisation of the Palace of the Sick in Jerusalem.' It shows that the admission procedure began with the confession of sins to the chaplain followed by a meal. Clothes were then exchanged for bed clothes used in the hospital and the pilgrim was given eating and drinking utensils. The daily routine comprised of mass every morning and a procession through the wards every evening saying prayers. Patients ate at tables and the linen was changed every two months. Details of food given included white bread, wine twice a day, meat such as poultry, young goat and lamb and vegetables such as vegetable broth and barley-meal gruel. If the doctors advised it further foods were given. Boar (male pig) could also be served between Michaelmas and Lent but never meat of the sow (female). The same advice on the time of year that pork could be eaten is found in eastern

texts on dietetics, such as the fourth century work of Oribasius of Pergamon (Oribasius 1997 p.37). The sick were also given fruits such as pomegranates, apples, pears, plums, figs and grapes and other treats such as almond milk. Interestingly, cereal and pollen grains of wheat, barley and rye along with fig seeds have been recovered from excavation of the latrines of the Order of St. John in Acre (Mitchell, MO 3). Foods forbidden in the hospital included lentils, beans, eels and cheese. A discussion of the dietary regime in hospitals of the Order of St. John, of the Temple and the Teutonic Order is made later in this chapter and comparisons made with dietary advice in medical texts from Europe and the Middle East. Such a comparison allows an assessment of the dominant influences upon Frankish hospitals, to see if they followed European or eastern ideologies. Fascinatingly, the findings suggest that previous ideas as to the principal influences of medical care in Frankish hospitals may have been entirely wrong. There were twelve sergeants per ward in the day and two at night, to make beds, wash the patients, bring them fresh water and take them to the toilets. The weakest patients were under the care of a '*fisicien*' while other patients were looked after by the '*mieges*'. A new doctor was required to take an oath when he started work in the hospital and would, 'would swear by the saints or would vow to do all in his power to look after the sick.' It has been suggested that these two alternative versions of the oath enabled doctors of all religions to work in the hospital (Edgington 1998; Edgington 1999). Christians would be expected to swear by the saints while non-Christian doctors would chose the latter oath. A parallel can be found in records of the order's hospital on Rhodes in 1445, when a Jewish doctor named Jacuda Gratiano was employed after swearing his oath on Jewish holy scriptures (Luttrell 1994). 1,500 bezants were allocated each year to hire doctors and buy almonds for the sick. While it is not clear what proportion of this figure was for doctors rather than almonds, it does suggest that the pay was probably generous. The Italian master Robertus medicus was paid 100 bezants a year in 1220 to treat the Bolognese troops on the

Fifth Crusade to Egypt (Annali Bolognesi 1789 vol.2,pt2, p.442). If it is assumed that all eight doctors in the hospital of St. John in the 1180's received this salary then that would still only account for 800 bezants, leaving enough money to buy an awful lot of almonds. When the effects of medieval inflation and coin debasement are born in mind it can be seen that 100 bezants would have bought much more in the 1180's than the 1220's. Clearly this approach has its limitations as not all doctors would have received the same wage, depending on their experience and qualifications. The *fisicien* may well have received more than the *mieges*, for example. However, it does suggest that wages for doctors in the hospital would have been generous.

Another highly informative manuscript discovered recently dates from the 1180's, in which an anonymous cleric wrote of his experiences while as a patient in the hospital of St. John in Jerusalem (Kedar 1998). This eye witness says that it was not only Christians who stayed in the hospital but also Jews and 'pagans' (Muslims). This is particularly interesting bearing in mind the high profile of religious ceremonies in the daily life of the hospital, which might be expected to have put off people from non-Christian religions from attending. The section of the hospital for men was divided up into eleven wards and if all the beds became full then the brethren gave up their own beds to create new wards for the hospital. The section for women was also divided up into wards but no information was given as to the number, presumably as the writer would not have been allowed into these areas. There were apparently 143 male nurses for the eleven male wards which equate to thirteen per ward, not that different to the evidence in the statutes. The doctors (both *medici* and *cyrugici*) were salaried and employed exclusively in the hospital. They visited the sick twice each day, accompanied by two servants, when they checked their urine and pulse (see Wallis 2000). One of these servants would hold up the urine flasks for the doctor to examine it and then discard the contents once no longer needed. The other carried 'syrups, oxymel, electuaries and

other medicines'. Medical texts of the period were full of praise for oxymel, a liquid made from vinegar and sugar syrup. The contemporary Arabic book of pharmacy by Al-Samarqandi (died 1210) wrote, 'oxymel is a syrup which is beneficial in acute fevers as it calms the heat, prevents putrefaction, stops the confusion of humours and opens obstruction (Al-Samarqandi 1967 p.62). The doctor's dietary instructions were recorded for each patient and arrangements made for bloodletting as required. Like the doctors, the bloodletters (*minutores*) were also paid a regular salary by the hospital. The section '*De cyrugicis hospitale*' described how surgeons from the hospital accompanied the Christian army into battle and treated the wounded in tents. There was also reference to 'the strength in stones and the power in herbs' and that all medicines requested by the doctors were provided by the order's treasury. It is not clear if the stones mentioned were ground and then used topically as poultices or taken orally, or whether the stones were used whole as amulets (Spier 1993; Meaney 1981). While there is no direct evidence for the names of doctors who worked in the hospital, a number did sign documents of the order at locations where a hospital was known and some of these were wills, suggesting that the individual may have been a patient there. Master Bertrandus and master Petrus Maurinus signed the will of Count Henry I of Rodez in 1221 as he lay in the hospital of St. John at Acre (Documents Historiques 1900 p.19) and master Johannes medicus witnessed a document written in the Acre complex in 1244 (Regesta Regni 1893 p.299 doc.1122). It is possible that these practitioners may have been employed by the order to work in the hospital at those times.

At last firm evidence for the medical treatment of the sick in the hospital of St. John is found, eighty years after the foundation of the Frankish states. While there are references to the presence of sick in the hospital since the 1130's, it is only in the 1180's that doctors are mentioned. Not only were doctors employed then but there are references to medicines and the sugar cane to make them with. This implies that the hospital prepared much of its own

drugs rather than buying them all ready made from apothecaries in the town. The evidence from these texts does not, of course, mean that the hospital did not provide medical care before the 1180's, but the evidence for it is lacking at present. However, it does suggest that back in the times of the Amalfitans or Brother Gerard the institution should not be thought of in the same way as the hospital that had evolved by the 1180s.

A rough idea of the structure of the hospital for the sick in Jerusalem can be gathered from the account of John of Maundeville (John of Maundeville 1848 p.168), writing in the fourteenth century. 'In it are one hundred and twenty four pillars of stone, and in the walls of the house, besides the number aforesaid, there are fifty four pillars which support the house. From that hospital going towards the east is a very fair church, which is called Our Lady the Great, and after it another very near, called Our Lady the Latin'. Archaeological excavation of the complex of St. John in Jerusalem took place at the very end of the nineteenth century. The report (Schick 1902) confirms details in the contemporary descriptions, and gives important structural information. 'Being all erected about the same time, the buildings were all according to one plan and style, massive with square piers, supporting vaults and arches..... The whole area of the place formed one building, although consisting of various parts and often divided by narrow lanes, containing some open, but small, courts for light and air.' The location of the hospital for sick poor in the complex is identifiable on comparing the record of Sir John Maundeville with the excavation plan. It was situated in the northwest corner of the complex, to the west of the Church of Maria Latina Major and north of the church of St. John. The building is supported by fifty four pillars, exactly the number counted by Maundeville. The internal dimensions of this hall were 230 feet (70 m) by 120 feet (36.5 m) with its long axis approximately north-south. The arches were about eighteen foot high (5.5 m). The roof of the main part of the hall was supported by three rows of seven piers, creating thirty two bays. Three more piers supported a six bay extension to the south, resulting in a

total of thirty eight bays in the hospital. Some pillars in the complex were noted to be particularly thick which suggests that originally there would have been upper floors to a number of buildings. There were a considerable number of cisterns underneath the complex for collection of rain during the winter, ensuring adequate water supply, and effluent was removed via a network of drains. The west entrance of the church of St. Mary Major opened directly to the fifth east-west vault of the hospital, so providing the medicine for the soul typical of Latin hospitals. It has been suggested that the part of the hospital for women was located in the east of the complex (Boas 2001 p.87). However, the building proposed is not adjacent to any of the churches in the complex, nor does it contain its own chapel. In consequence this building is highly unlikely to have been a hospital, as the intimate association with a church is not present.

The dead mentioned by John of Würzburg and others would have been buried in the communal cemetery for deceased pilgrims at the Hospitaller church of St. Mary in Aceldama, to the south of the city walls (Pringle 1990-1). The church and surrounding land was given to the Order of St. John in 1143 by William I, Patriarch of Jerusalem (Cartulaire General 1894-1906 vol.1 p.121-2 cart.150). Theodorich (Theodorich 1988 p.277) wrote that, 'In the field of Aceldama, which is separated from Mount Zion only by a valley, is the burial place of strangers. In it is the Church of the Saint and Virgin and Mother of God Mary. It is also where, on the Holy Day of Palms, we buried a brother who had died. His name was Adolf and he was born in Cologne'. Burials did not only take place on the hillside but also deep underground in an unusual building. The nineteenth century excavation report (Schick 1892) described the structure at Aceldama as a

> 'building 78 feet long and 57 feet wide, erected over rock-cut caves and a deep trench .....situated on a steep slope of a rocky hill. At the southern part the roof consists of rock and is level with the hillside and the northern part, being 20 feet lower, is walled

up as a rectangular building, roofed with a vault just over the deep rock-hewn trench, which is 63 feet long and 21 feet wide..... From the top of the roof to the accumulation is 44 feet ..... The depth of the accumulation is not known.

There was a central pier of rock and masonry to support the roof. The masonry work of the walls in the west, north and east, standing on perpendicular rock scarps, seems to be crusading. In the centre of the arch are in one line, at equal distances, nine openings or holes of a square form, nearly two feet wide, which could be covered by flat stones. There were four more square holes 3 foot 4 inches across.

The reason for all these holes was certainly to give light and allow access for air; but they may also have served, as many writers say, for letting down the dead bodies.'

The order ran further hospitals throughout the Latin East and played a major role in the treatment of the sick in the Levant. The medical nature of the order means that wherever they had a large complex, it is highly likely there would have been facilities for caring for the sick, even if only an infirmary for the brethren themselves. Changing fortunes and Islamic victories occasionally led to evacuation of these hospitals, as took place in Jerusalem following Saladin's victory at the Battle of Hattin on 4 July 1187. He did, unusually for the period, allow ten Hospitallers to stay to care for those sick too unwell to travel. The rest moved to Tyre along with many of the Latin population (Ibn al-Athir 1969 p.180; Cartulaire General 1894-1906, vol.1, p.531-2,cart.858) and then to Margat which was a town near to the northern boundary of the county of Tripoli.

The hospital of St. John the Baptist was run by the Order of St. John in Nablus in the twelfth century. The order had possessed property there at least since 1110, shown by the donation of houses and a mill by King Baldwin I on 28 September of that year (Cartulaire General 1894-1906 vol.1 p.21 cart.20). At some time in the next fifty years the order had set

up a hospitale for the poor. King Baldwin III mentions the institution's name as St. John the Baptist in a record of 7 June 1156 (Cartulaire General 1894-1906 vol.1 p.183-4 cart.244). In 1166 King Amalric confirmed the Order of St. John's possession of the hospitale in Nablus and of the alms given by previous monarchs, 'on the condition that this hospital always serves the sick' (Cartulaire General 1894-1906 vol.1 p.245 cart.355). This reference to the sick shows that this was not merely a pilgrim hostel but a hospital. The complex of St. John in Nablus is thought to have been located on what is now the street of the Prophets. Only the western one third remains, but plans and photographs of the town before the demolition (Pringle 1993- vol.2 p.104-7) suggest that there was a barrel vaulted structure 50-55m long and 15-16m wide. This barrel vaulting ties in well with an early construction date for the complex and contrasts with the romanesque vaults of the later complex of the order in Acre. The surviving part of the vault is 7.8m wide internally, is constructed from rubble and supported with an ashlar-built transverse arch. Originally the entire surface would have been covered with layers of plaster. The north wall of the vault is 4m thick and possessed a tower, suggestive of an outer wall, while the much thinner southern wall had three doorways. However, it is not known whether this particular part of the complex housed the sick, lodged pilgrims overnight or was for use by members of the order for other functions. The hospital complex was lost to the Franks along with the rest of Nablus after the disastrous battle of Hattin in 1187.

The order's hospital at Acre was functional at least by 1175 (Cartulaire General 1894-1906 vol.1 p.323 cart.471), and was located in the northern part of the city. The Hospitallers had property in Acre as early as 1110 (Cartulaire General 1894-1906 vol.1 p.21 cart.20) and since their principal role in the early years was to care for the poor and infirm, it is likely that there was at least a hostel for these people in this large port even then. Statutes of the order (Cartulaire General 1894-1906 vol.2 p.731-2 cart.2612) show that the hospital for sick

pilgrims was in the actual Hospitaller complex, not separate as some had suggested (King 1934 p.104 note 4) in the northern suburb of Montmusard. The hospital of St. John for sick poor was known as the *Palais des Malades* while the *Hospitale* written on contemporary maps refers to the fortress of St. John with the residence of the Grand Master. Much of the site of the Hospitaller complex in Acre has been excavated and remains have been found that are though to represent several towers, a refectory, dormitory, cloister, reception hall, latrines, barracks and bath house (Goldman 1966; Goldman 1994). However, the various buildings previously identified as the hospital of sick pilgrims have since been reassessed and now are believed to have performed other functions. The search for the hospital for sick pilgrims and the infirmary is at present ongoing. These are thought to have been located in the south of the complex as the plan of Frankish Acre by Paolino Veneto (Rome, Vaticana MS) locates the *domus infirmorum* to the south of the other buildings.

In 1200 the bishop of Acre gave the order land for a cemetery by the walls of the city (Cartulaire General 1894-1906 vol.1 p.689-90 cart.1113), which may have been the church of St. Michael where the masters of the order were buried by the middle of that century, as recorded in a statute of 1263 (Cartulaire General 1894-1906 vol.3.p.75-7 cart.3075 stat.6). Before that time it seems that the dead from the hospital were buried in the public cemetery of the city. In the summer of 1250 Lord John of Joinville stayed at the church of St. Michael while sick himself. He mentioned that, 'there was no day on which twenty or more dead were not carried into the church and from my bed, as each was carried in, I heard the chant of *Libera me Domine*' (John of Joinville 1955 p.129). He may well have been watching those who had just died in the nearby hospital of St. John for sick poor. By 1263 a priest and an acolyte were continuously looking after the spiritual welfare of the sick in the hospital at Acre. At the church of St. Michael another priest, again assisted by an acolyte, said repeated masses for the dead (Cartulaire General 1894-1906 vol.3 p.75-7 cart.3075 stat.5). The

competition between the order and the secular church led to conflict over donations recorded in the wills of the sick. Legislation was introduced in 1175 to prevent disputes, so that if any sick person with a will in favour of the Church at Acre entered the order's hospital and died within seven days, his will remained valid unless he changed it during that time (Cartulaire General 1894-1906 vol.1 p.323-4 cart.471).

While the Order of St. John founded some *hospitalia* and renovated derelict ones, it also took over a number of functioning institutions throughout the Latin East which were run by smaller organisations. These were not always specifically referred to as caring for the sick but the medical function of the order suggests that these *hospitalia* may have performed a medical role alongside just feeding the poor. However, it could also be argued that since the order did provide pilgrim hostels, the *hospitalia* discussed here may have merely provided food and accommodation. For example, a *hospitale pauperum quod est in Monte Peregrino* (Tripoli), to the north of the kingdom of Jerusalem, was founded by Count Raymond of Saint Gilles and extended by his successor Bertrand of Tripoli. On 28 December 1126 Count Pons put an end to the independence of the hospitale by transferring it to the Order of St. John (Cartulaire General 1894-1906 vol.1 p.74-5 cart.79). The church and cemetery of Mont Pelerin have been excavated and lay a short distance to the southeast of the city (Salame-Sarkis 1980 p.95-119). Unfortunately it is unclear exactly where the hospital lay. Likewise in the county of Edessa there was a hospitale attached to the church of St. Romain at Turbessel. This was endowed by Joscelin I of Courtnenay and King Baldwin II, but given to the Order of St. John in 1134 by Joscelin II with the agreement of the archbishop responsible for the diocese (Cartulaire General 1894-1906 vol.1 p.89-90 cart.104). It has also been tentatively suggested that the order's property at Aqua Bella near Jerusalem may have been an infirmary for sick, aged or wounded members of the order (Pringle 1992) but the evidence for such a suggestion is rather weak.

With time there developed a structural hierarchy responsible for the caring activities of the order. The Hospitaller was head of these activities, with his office appearing by 1155 (Cartulaire General 1894-1906 vol.1 p.178 cart.234). His seal was made in black wax, in contrast to the comparable seals of the Grand Commander and Marshall which were in green. The contemporary thirteenth century manuscript *Ci Dit des Bulles que le Maistre et les Autres Baillis del Hospital Bullent* (King 1932 p.42,127) described the seal of the Hospitaller 'with a bed, having on it a sick man, with a brother who gives him (food) to eat'. Under him were the Seneschal of the *Palais des Malades*, the Almoner and the Infirmarian. Supervised by the Seneschal of the *Palais des Malades* were those taking care of the sick in the hospital. By the end of the 1180's the principal hospital employed four physicians and four surgeons (laymen not members of the order), nine sergeants per hospital ward (brethren of the order) and by the 1260's a priest and acolyte. During the twelfth century the Almoner was responsible for distribution of clothes and food to the poor. The post of Infirmarian, who ran the infirmary for sick members of the order, is not recorded before 1235. However, the early references to infirmarian do not imply that the post was a new one and it would be expected that someone would have been responsible for similar duties before this time. As well as the brethren of the order, there appear to have been volunteers who helped care for the sick but were not full members. Sancha, the daughter of King James I of Aragon, is believed to have helped care for those in the Acre hospital anonymously up until her death in 1275 (Luttrell 1998).

The infirmarian was a brother sergeant, subordinate to the Hospitaller. In November 1235 the post was held by brother Johann, in December 1238 by brother Andrew and in August 1248 by Bernard Corbel (Cartulaire General 1894-1906 vol.2 p.493 cart.2126; p.536 cart.2212; p.673-4 cart.2482). The infirmary was distinct from the hospital for sick pilgrims at least in thirteenth century Acre, and cared for members of the Order of St. John who were

ill. Master Hugh Ravel in the General Chapter of September 1262 tells us (Cartulaire General 1894-1906 vol.3 p.43-54 cart.3039 art.33) that in the infirmary, the doctor's rounds were twice daily, as it is recorded that, "at all times at which the doctor [*miege/medicus*] shall visit the brethren the brother of the infirmary should go with him, that is to say in the morning and in the evening." The use of the term in the singular might imply that just one doctor was responsible for the infirmary in contrast to the eight who worked in the hospital for sick poor. By 1300 the statutes of Master Guillaume de Villaret record that doctors working in the infirmary in Cyprus had to take an oath of allegiance to the order before the Infirmarian and seven other brother representatives of the order (Cartulaire General 1894-1906 vol.3 p.810-6 cart.4515 stat.5). Records of 23 November 1304 clearly describe spatial separation of the Hospital for the Sick Poor and the Infirmary at Limassol (Cartulaire General 1894-1906 vol.4 p.93-4 cart.4672 stat.1&2). This confirms the approach of the order that sick brothers should be cared for separately from pilgrims, which is implied by earlier references to doctors rounds specifically in the infirmary at Acre.

Passing references to the use of bloodletting by members of the order do confirm its frequent use for both disease treatment and prophylaxis within the hospital, as would be expected following Galenic medical practise (Brain 1986 p.67-99). In the *Esgarts* (judgements) of 1239 it is recorded (Cartulaire General 1894-1906 vol.2 p.546 cart.2213 stat.78) that, 'if any brother have himself bled without leave, unless it be in case of illness.....let him undergo seven days penance.' The *Usances* (customs of the Hospital) of the same year also include information (Cartulaire General 1894-1906 vol.2 p.548-61 cart.2213 stat.105) on the prophylactic use of phlebotomy as, 'in the house of the Hospital it is customary that the brethren should be bled on Saturdays.'

The Order of St. John first took on its military role in the 1130s and 40s, receiving the important castle of Bethgibelin in the south of the kingdom of Jerusalem from King Fulk

in 1136 (Cartulaire General 1894-1906 vol.1 p.97-8 cart 116), and the famous fortress of Crac des Chevaliers from Count Raymond II of Tripoli in 1144. The Papal Bull *Quam Amabilis* of Innocent II in 1139-43 mentions the protection of pilgrim routes by the knights of St. John (Cartulaire General 1894-1906 vol.1 p.107-8 cart.130). It seems they saw armed protection of pilgrims an extension of their care for the poor in their hospitals (Forey 1984).

To summarise, in the early years the hospitals of the Order of St. John functioned to care for poor, weak and old pilgrims by providing food and a bed in a religious environment. This was very similar to a typical hospitale back in Europe. After a number of decades the function evolved so that by the 1180's there is firm evidence for the medical treatment of sick pilgrims in the order's *hospitalia* at Acre, Jerusalem, Nablus and Tyre. However, the exact time when medical activities were added to the earlier supportive care of the poor is not clear. By 1235 there was an infirmary for sick members of the order at Acre and later at Limassol, which were distinct from the *Palais des Malades*. Other establishments referred to as *hospitalia* where medical practice is suspected, but not proven, include Tripoli and Turbessel. Medical practitioners working in the hospital included a *physicus*, several *medici*, *cyrurgici* and a number of *minutores*. Conditions managed there ranged from weapon injuries to the delivery of babies. Treatments known to have been employed include dietary modification, drugs such as oxymel and electuaries, bloodletting and surgery. They also provided a mobile field hospital which accompanied the army into battle, where surgeons from the hospital in Jerusalem worked in tents on the battlefield. It has been suggested that the hospital of St. John was backward, even 'Third World', compared with equivalent institutions in the medieval Middle East, since it had only eight doctors for 1,000 people while Islamic and Byzantine hospitals typically had a much better doctor:patient ratio (Kedar 1998). However, it must be remembered that the majority of patients in this hospital were poor and hungry pilgrims rather than people who were acutely unwell with a specific illness. Most just needed

rest, shelter and plenty of food to allow them to regain their strength after an arduous journey east and without family in the Frankish states there was no one else to care for them. These people would not have needed the attention of a doctor. Consequently, using the doctor: patient ratio in different institutions to compare the standard of care in Frankish and non-Frankish hospitals is not very reliable as it is not a comparison of like with like. The patients in the hospital of St. John were a different group to typical hospitals elsewhere in the eastern Mediterranean and the hospital performed a rather different role. In view of this it is not really possible to say if the hospitals of the order of St. John in the Latin East were any better or worse than the equivalents in neighbouring countries. However, it would be safe to say that at least by the 1180's they appear to be very different to European hospitalia, having evolved to undertake a very distinctive function.

The Order of the Temple

The Templars were founded in 1120 by a group of knights led by Hugh of Payns (Partner 1987 p.1-23; Barber 1994; Luttrell 1996). Their aim was to protect pilgrims from brigands, Muslim raids and wild animals. This was a real problem in the early years of the Frankish states, and some chroniclers mention how human bodies were left to decompose by the side of certain roads after attacks as people were too scared to stop and bury them (Saewulf 1988 p.100). The order received its name from the position of their headquarters, given space at the south of the former Jewish Temple in Jerusalem by King Baldwin II, in and around the Aqsa mosque (Gabrieli 1969 p.144). Originally attached to the regular canons of the Holy Sepulchre, in 1129 they were recognised as a formal military order by the pope. The knights wore white mantles with a red cross while sergeants and squires wore black or brown mantles and their rule was based on that of the Cistercians (Rule of the Templars 1992 p.3).

While no Templar infirmary has ever been excavated, the complex of the order in Jerusalem was surveyed during the repairs to the Aqsa mosque of 1938-42 (Hamilton 1949). Unfortunately, those areas around the Aqsa mosque that were not of Muslim origin have been removed since that time. New buildings constructed by the Templars stretched to both east and west of the mosque building, and the infirmary is likely to have been located in one of these halls. While the presence of a church is often a good guide to the location of a monastic infirmary, churches and chapels are thought to have been located to both east and west of the Aqsa (Boas 2001 p.91) and consequently the exact position of the infirmary remains unclear.

This infirmary was not established to serve the sick or poor in general but was founded purely for members of the order who were unwell. While the Templars did provide food for the hungry (Rule of the Templars 1992 p.102 stat.370-1; Barber 2000) and a few hostels to house the poor, such as at Valancia in the county of Tripoli (Regesta Regni 1904 p.40 no.614(b)), their medical activities were for the sick of their own order. As such it is an example of a specialist hospital at the opposite extreme from that of the Order of St. John. It is unknown just how many infirmaries the Order of the Temple ran in the Latin East. In the whole of England there were just two and only one in the kingdom of Aragon in Spain (Parker 1963; Forey 1973 p.292-3). It could be assumed that the headquarters of the order would have contained an infirmary and this would have been Jerusalem in the twelfth century and Acre for most of the thirteenth century. In the thirteenth century the order is thought to have comprised of 600 knights and 2,500 sergeants in the Frankish states (Barber 1994 p.2). The military function of the order resulted in many injuries and the evidence for weapon injuries from Templar sites such as *Le Petit Gerin* illustrate this (Mitchell 1997). It would have been sensible for the order to provide an appropriate medical service for them so that they could be fit for active service as quickly as possible. Its soldiers would also have been at risk of

contracting any of the infectious diseases present in the near East at that time, just as the general population were, and supportive treatment may have helped them to recover. Segregation of the sick in an infirmary may also have lessened the risks of transfer of some conditions to healthy members of the order. The geography of the Frankish states meant that many sick brothers in the north of the region would have had an arduous journey travelling south to the headquarters, one that many may not have survived. In consequence it is possible that they may have run infirmaries at other large cities further north, such as Tripoli and Antioch. There is reference to the presence of the sick together in a room in the Templar Castle of *La Feve* in 1187 (Continuation of William of Tyre 1996 p.33) and this might suggest that any Templar stronghold was able to look after its sick or wounded, at least in the short term, by calling in local doctors as required.

The hierarchical statutes are thought to date from around 1165. The section *The Retrais of the Infirmarer Brother* (Rule of the Templars 1992 p.65-6) gives valuable information about the diseases, treatments and general approach found in the infirmary. All members of the order who were ill for longer than one day were required to go to the infirmary except the Master, who had special dispensation to stay in his own room. Just as with the Order of St. John, those entering the infirmary were to confess their sins and receive communion before they did so. If severely ill, the chaplain could perform extreme unction as well. While most conditions were treated within the infirmary hall itself, those diseases which would have caused distress or annoyance to other patients were given a separate room as close as possible to the infirmary. One group included under this section were those with vomiting and diarrhoea. In the hot weather of the eastern Mediterranean it is likely that most diseases causing these symptoms would have been bacterial or viral infections such as gastroenteritis and dysentery. A patient with this kind of illness would have been both noisy and smelly and this would have explained the segregation. An alternative theory is that they

may also have noticed that these conditions could be transmitted from one person to the next, although they would not have understood the role of pathogenic microorganisms in this process. Segregation should have made this spread less likely and even in modern hospitals it is normal to manage patients with infective gastrointestinal illness in side rooms. The other conditions treated separately were those with serious wounds and those who were delirious. Even if a Templar knight or sergeant survived the immediate effects of wound in battle it was by no means certain that he would recover. The potential for wound infections and gangrene was significant and many may have died in the following days. The Middle East is known for its flies and these are attracted to wounds and decaying unviable flesh. Any wound left uncovered for even a few minutes would have run the risk of flies landing on it and laying their eggs. While maggots in the wound may have helped some aspects of healing by removing the unviable tissues (Baer 1931; Goldstein 1931), flies have a cocktail of bacteria on their feet from their habit of landing on waste and these bacteria would have been transferred onto any open wounds, so making infections more likely. If the groans of pain from these patients did not keep everyone else awake at night then the foul smell from gangrenous wounds would have. Delirium is an acute confusional state resulting from reversible functional impairment of the brain and may be triggered by infection or trauma (Meagher 2001). The fevers accompanying a range of infectious diseases from malaria to wound infections may cause delirium and both these conditions are referred to in the statutes. The confusion associated with delirium may have lead to the patient wandering about the infirmary, calling out at night or otherwise creating disturbance and this may well be the reason they were nursed separately. This separation is as close a scenario to the eastern practice of separating patients into wards by their diagnosis as I have yet found. Patients with diarrhoea, fevers causing delirium and those requiring surgery were each nursed in their own separate wards in some of the wealthier eastern hospitals such as the Mansuri hospital in Egypt (Dunlop 1960) and the

Pantocrator xenon in Constantinople (Codellas 1942; Miller 1997 p.12-21; Gautier 1974). However, in contrast to Byzantine and Islamic hospitals, such patients do not seem to have been actively placed together in discrete groups by their diagnosis but this was rather a blanket exclusion from the principal ward. When patients with these conditions were improving they could join the others in the infirmary once, 'the other brothers could tolerate their presence.'

The bulk of the statutes cover diet in the infirmary. This is not surprising as dietary modification was seen as the basic starting point for the treatment of any disease. There were a number of foods regarded as good or bad and therefore encouraged or excluded, just as in the Hospital of St. John. Interestingly, statutes showed that the infirmarian was required to ask the patient himself what he could and could not tolerate, rather than recommending that a doctor should determine the dietary regime for the patient in each case. Foods thought to be bad for the patients included certain plants (lentils, broad beans and cabbage), particular meats (beef, goat, mutton and veal) and some fish (trout and eels). Cheese was never to be given in the infirmary.

Medicines were referred to and the commander was required to give the infirmarer, 'the means with which to buy the medicines they need.' The infirmarer was put in charge of the garden, but it is not clear if this was just so food plants suitable for the patients could be grown or whether medicinal herbs were grown there too. Syrup, from sugar cane, was also mentioned in the statutes and it was to be given to those patients who asked for it.

The functions of the barber were also included in the rule although mention of the actual barber was not. The infirmarer was able to give permission for the patients to have their heads shaved or undergo bloodletting but the master of the house had to give permission for surgery to take place for a serious weapon injury. It is possible that this was to prevent the barber from undertaking surgical procedures that were too complicated and so enable a

surgeon to be brought in. There were a number of references to the practice of bloodletting, on both the healthy and the sick. Healthy brothers were allowed to eat three meals in the infirmary after undergoing bloodletting, presumably as the special diet was thought to help them recover their strength. It is not recorded if bloodletters or barbers were hired on a regular basis to perform these tasks, if they came in just when called for or if the infirmarian or members of the order themselves were able to perform bloodletting. The infirmarian was a brother of the order and not a trained medical practitioner. However, the fact that he organised the appropriate food for the patients, bought medicines from town and perhaps grew them in the garden and also decided when bloodletting could take place does suggest that he needed reasonable medical experience. It is possible that he would have gained this by working in the infirmary for a number of years and receiving on the job training from the previous infirmarer. It is presumed that the sick were washed and nursed while in the infirmary but there is no evidence to say who did this. It may well have been members of the order, but since the Templars were not a medical order themselves outside help is theoretically possible. There was also reference to the work of actual doctors in the infirmary. Just as was the case with other orders, these were laymen and not Templars. The master of the house was responsible for finding, 'a doctor for the sick brothers so that he may visit them and advise them on their illnesses.' There is also some evidence that the order owned medical books that might have been of great use to doctors treating the injured. On the dissolution of the Order of the Temple in 1308 a list of those books held by the order in Aragon was sent to King James II. A copy of the *Chirurgia* of Theodorich Borgognoni was included, written in the vernacular rather than Latin (Viage Literario 1806). While there is no way of knowing if this text was specifically for reference use in a Templar infirmary the choice of such a practical book on the treatment of weapon injuries (Theodorich Borgognoni 1955-60) held by a military order, written in the local language, means that this possibility

should be considered. It is a shame that no similar lists for other Templar commanderies have come to light that might show if this practice was more widespread.

This evidence shows how the Templar infirmary performed two very different roles. Firstly it was similar to a closed monastic infirmary in the sense that it was just for members of the order and provided a place for the sick to go until they died or recovered. They were treated with the standard approach of prayer, dietary modification, medicines and bloodletting. The healthy members who underwent their regular prophylactic bloodletting in the infirmary also ate a special strengthening diet for a short period. In contrast to the monastic setting, the military function of the Knights Templar resulted in members of their order sustaining significant weapon injuries in battle. Operations on these wounds were alluded to and the master was responsible for ensuring they were managed by the most appropriate practitioner. Such records show that these unusual infirmaries were able to provide a medical service with all the components expected for the medieval period.

The Order of St. Mary of the Germans (Teutonic Knights)

The hospitale of St. Mary of the Germans was established in Jerusalem in the early years of the Frankish states. At that time it did not develop into a religious order as had been the case for the Hospitallers and the Templars. This may have been due to the fact that the founders were married. In his *History of Jerusalem*, Jacques de Vitry (Jacques de Vitry 1971 p.55) said of its origins that,

> 'many Teutons and Almayns who went to Jerusalem on pilgrimage could not speak the tongue of the city, so the divine clemency inspired an honourable and religious Teuton, who dwelt in the city with his wife, to build a hospice at his own cost,

wherein he might entertain poor and sick Teutons..... For a long time, in great poverty, he ministered to the sick and needy.'

In 1143 a German hospitale in Jerusalem, probably the one described by Jacques de Vitry, was shown to be subordinated to the Order of St. John by Pope Celestine II in a letter of 9 December to Master Raymond of the Hospitallers (Regesta Regni 1893 p.54-5 no.214). The fact that this institution was under the control of the Knights Hospitallers may suggest that the Complex of St. Mary in Jerusalem provided medical care for the sick, rather than just performing the role of a pilgrim hostel. This is confirmed by a document of 26th March 1173 from King Amalric I which referred to '*infirmis*' in the German hospital (Tabulae Ordinis 1896 p.7-8 doc.6) and a later charter of Amalric from 1177 confirmed a number of properties and farmland owned by the hospital, including sugar cane from Nablus which was for the sick. This suggests the use of syrups and electuaries for the treatment of the sick just as took place in the Order of St. John around that time (Cartulaire General 1894-1906 vol.1 p.425-9 cart.627). However, no references to the employment of doctors have come to light for this early period. John of Würzburg noted the complex of St. Mary in Jerusalem as it was around 1165 (John of Würzburg 1988 p.267), positioned in the south of the city. He wrote, 'On the way down the same street, which goes to the gate by which one reaches the Temple, and on the right, is a cross street with a long portico. In this street is a hospice with a church which has been newly built in honour of St. Mary, and is called the House of the Germans'.

Based on this description the compound has been identified and subsequently excavated (Ovadiah 1993). It has been proposed that from north to south the structures represented a hostel for pilgrims, the Church of St. Mary and the hospital for the sick, each adjoining and aligned on an axis approximately east-west. Evidence for the location of an infirmary for the sick in this area is debatable since there are no chronicles detailing the

internal layout, as was the case for the Order of St. John in Jerusalem, nor was any medical debris excavated, such as broken pharmacy jars or urine bottles. In consequence it is arguable as to whether the infirm would have been separated from pilgrims boarding there in the early years. The excavation confirmed that the complex was on a street corner, with a three meter wide paved road covered with arches, as noted by John of Würzburg, lying adjacent to the hospital. An ornate painted ceremonial hall was built above the area suggested to be the hospital. The entrance to the north western corner of this lower hall was down a set of stairs from the south side of the church. The hall was rectangular in plan, being 25m long and 12m wide, with an eight bay ribbed vaulted roof construction and three supporting central piers. At the eastern end were two narrow windows and originally all four bays in the southern wall had a window. The floor was of flagstones while there was a plaster ceiling and there remain small areas of plaster on the walls. Despite the compound's proximity to an aqueduct, five cisterns had been dug to collect rainwater. Discarded thirteenth century glazed pottery fragments were recovered from these cisterns and may have been dishes used by the pilgrims. All were of local manufacture or imported from the east, with no imports from Europe. While it is not known for certain whether these sherds originated during the Frankish occupation between 1229-44 (Ben Dov 1993), it may be that they were dumped after the sack of the city. It is presumed that the complex was evacuated in 1187 when Jerusalem fell to Saladin but it is not clear where it settled after that. Other hospitals, such as the Order of St. John, moved to Tyre and then Margat along with the rest of the population (Ibn al-Athir 1969 p.180) so it is quite likely the Germans fled there too.

In 1190 during the long siege of Acre by Christian forces in the Third Crusade merchants and sailors from the Baltic Sea, Bremen and Hamburg established an improvised field hospital made out of wood from dismantled ships and roofed with sail canvas. After the siege was over they moved inside the city near the gate of St. Nicholas where they built a

hospitale, church and other buildings (Tabulae Ordinis 1869 p.22 doc.25; p.23 docs.26-7). The *Ospital des Alemans* was later mentioned in Matthew Paris' description of Acre (Matthew Paris 1882 p.136) and the complex was marked on the map of Pietro Vesconte (Rome, Vaticana MS) in the eastern part of the old city. Interestingly, even at this early stage the hospital is referred to as the hospital of St. Mary of the Germans of Jerusalem. This demonstrates that it was not a completely new foundation by the crusaders from Bremen and Hamburg as it would surely have had a different name. One possibility is that staff from the hospital of St. Mary had left their temporary home further north and helped care for the wounded in the field hospital at the siege of Acre. Alternatively, on retaking Acre the brothers of the hospital of St. Mary might have moved into the city, as there would have been plenty of space shortly after the conquest, and taken over the care of the patients previously in the field hospital. By February 1192 the brothers of St. Mary were under the leadership of Gerard. At that time a charter of the German hospital is witnessed by members of the Order of St. John and the wording implies that the German institution had some degree of independence from them by that time (Tabulae Ordinis 1869 p.23 doc.26). The contemporary chronicle *The Continuation of William of Tyre* mentions the tension between the two orders from 1190 onwards (Continuation of William of Tyre 1996 p.90). 'At that time the German order could not cater for the sick because they did not yet have a hospital. For the Hospitallers of Saint John said that they had a privilege from Rome that said no one should have a hospital in the city of Acre unless they were subject to them. It used to happen that when a great man died in Acre, particularly if he died in the house of the Germans, they would go and seize him and bury him in their cemetery. At that time the German hospital did not have great power as it does now. The device that they wore on their mantles was a wheel with a half cross in black. The brother knights had mantles of Stamford cloth. They did not dare wear white mantles because of the Templars. But since the Damietta campaign [1217-

21] they have had their white mantles with the cross without the wheel.'

On 19 February 1199 Pope Innocent III confirmed the organisation as a religious order, the Teutonic Order. Their rule incorporated statutes from the Order of St. John regarding the care of the poor and sick (*infirmis*) and statutes of the Order of the Temple regarding the activities of clerics and soldiers (Tabulae Ordinis 1869 p.266 doc.297). At first glance this decision is rather perplexing. Since the Order of St. John was a major military force as well as a medical order, it might have been more sensible for the Teutonic Knights to adopt the entire Hospitaller rule than cobble together an ill fitting combination of the two rules. One reason for their choice may have been that they were striving to become distinct from the Hospitallers and adopting their rule in its entirety would hardly have helped their case for independence. Another possibility is that they adopted statutes from the two most powerful military orders in the Latin East to avoid making enemies of either. The statutes of the order stated that, 'in the principal house, which is the head of the order, doctors [*medici/mires*] are to be employed as the finances of the house allow and as the numbers of the sick require' (Die Statuten 1890 p.32 art.6). While the number of doctors hired was not stated as was the case for the Order of St. John, the use of the pleural does suggest that several may have been working there at any one time. The infirmarian in charge of the care of the sick was known as the *Spetelier/Hospitalarius* (Die Statuten 1890 p.36 art.6). The first Spittler known by name was Henry, a knight brother, in 1208 (Militzer 1998). He was responsible for ensuring that the diet in the infirmary was beneficial for the sick. Just as with the other medical orders, certain foods were prohibited for the sick and the list is very similar to that followed by the Order of St. John and the Templars. Beef, salt meat, salt fish, salt cheese, lentils and unpeeled beans were all avoided (Die Statuten 1890 p.66-8). Women were also engaged in caring for patients as, 'some work with the sick in hospitals ..... is more suited to the female sex' (Die Statuten 1890 p.52 art.31). It is likely they spent their time in the areas of the hospital which

would have been reserved for women who were sick or in labour. Drugs and medicines were clearly used in the infirmary as the statutes referred to the electuaries and syrups (Die Statuten 1890 p.66 art.7). A document of King Amalric II dating from February 1198 mentions sugar for the hospital of the St. Mary (Tabulae Ordinis 1869 p.27-8 doc.34). Although actual surgical procedures were not mentioned in the statutes, wounds from the dagger, sword and lance were (Die Statuten 1890 p.83 art.38) and the kind of doctors employed to work in the hospital (*medici* rather than *physici*) should have been able to treat these injuries. Bloodletting was referred to indirectly as the rule specifies certain days of the year when the procedure was forbidden (Die Statuten 1890 p.165), since it was widely thought that illness or even death could result if performed with the moon in the wrong phase (Voigts 1984; Harington 1953 p.85).

As the order was often referred to as *l'Ospital des Alemans* in the thirteenth century, it is hard to determine whether a particular site included a hospital that treated the sick or merely accommodation for pilgrims. While the rules of the order stated that every house had an infirmary for members of the order, only the principal house was obliged to have a hospital for the treatment of the sick in the general population. The order was able to accept hospitals donated to them, but the consent of the master of the order was required before a new hospital could be built and this may well have been due to the heavy cost of running them (Demel 1998; Forey 1992). With Jerusalem under Frankish rule between 1229 and 1244 it is presumed that the complex of St. Mary would have been reoccupied and the hospital there made functional once again. The Teutonic Order had bases in the major cities of the Latin East, such as in Tyre where the complex lay within the city near the posterne of the *Boucherie* (Phillipe de Navarre 1887 p.131; Tabulae Ordinis 1869 p.26 doc.31). It is quite possible that property of the order in larger cities may also have included a hospital for the general public as well. In Europe the order had been given at least twenty six hospitals by

1230 and had the potential to become a major source of charitable care there (Militzer 1998). However, it is thought that the order gradually lost its caring credibility, and perhaps competence, over the rest of the thirteenth century. The numbers of hospitals donated fell of significantly and the medical statutes inherited from the Order of St. John were not adapted or augmented, as was the case in other medical organisations, which suggests little interest in their medical role (van Eikels 1998). There is limited evidence to evaluate the medical capability of the order in the Frankish states themselves. However, the fact that they employed lay doctors would suggest that the level of competence for this aspect of patient care would have remained the same regardless of how well trained the order's own staff in the hospital might have been.

It seems the Teutonic Order initially attempted to perform a similar function to the Order of St. John, but presumably for German speaking pilgrims. It undertook a medical role alongside its military activities and treated both the general public and it's own knights and brothers. Lay doctors were contracted to work in the hospital, drugs and electuaries were referred to and there were separate sections in the hospital for male and female patients, each nursed by members of their own gender. The Teutonic Knights were given a number of hospitals, especially in Europe, but for various reasons its medical activities appear to have declined in importance while its military function continued to develop.

The Order of St. Thomas of Canterbury

The *Opera Historica* of Ralph of Diss (Ralph de Diceto 1876 vol.2 p.80-1), the archdeacon of Middlesex, records that this English order resulted from a vow taken by his own chaplain during the Third Crusade. The priest, named William, dedicated himself to nursing the sick and burying those who died from wounds or illness during the siege of Acre

in 1189-91. This was a very similar process to their German counterparts, the Teutonic Order, who were also founded at this time. William named the resulting organisation after the recently martyred St. Thomas Becket. The saint evidently appeared in a vision to English crusaders during their sea voyage (Benedict of Peterborough 1867 vol.2 p.116) which may contribute to explaining his choice as patron by Father William. Following the surrender of Acre to the crusaders, a charter of 10 February 1191 shows that the hospitale of St. Thomas was located in the east of the old city close to the Teutonic Order (Regesta Regni 1893 p.187 doc.701; Tabulae Ordinis 1869 p.24 doc.27). The small community followed the monastic rule of St. Augustine and were under the protection of King Richard-the-Lionheart. After the London house of the order was founded in the Parish of St. Mary Colechurch, a hospitale of St. Thomas was opened there too. A number of hospitalia were then donated to the order in England and Ireland (Page 1905-27 vol.3 p.486; Brooks 1956-7). On 13 October 1207, under Richard's successor King John, the hospitale in Acre had to send some members to England to beg for money for the redemption of prisoners (Dichter 1979 p.110) as their European houses were not making sufficient profit to fund this. In the early part of the century the order acquired the churches of St. Mary and St. Nicholas de Campo Anglorum in Acre, but they were still far from well off.

In 1227-8 their financial position improved when Peter des Roches the bishop of Winchester (1204-1238) accompanied a contingent of crusaders commanded by Richard of Cornwall, who crusaded with Frederick II during 1227-31 (Roger of Wendover 1887 vol.2,p.2). The chronicle of the Matthew Paris records that at his own expense the bishop transferred the order to a better position near the sea at the extreme north of Montmusard on the *Vicus Anglorum* where most of the English lived. Peter des Roches built them a new church and left a legacy of five hundred marks to assure the subsistence of his proteges (Matthew Paris 1852 vol.1 p.133; Matthew Paris, Michelant 1882 p.136). The regulations of

the order were also changed so that members followed the rule of the Teutonic Order, which means that they would have followed the medical statutes of the Order of St. John and the military statutes of the Templars. While records specifying medical practice have not survived, the order's origins as a field hospital and the decision to adopt the rule of a medical order rather than one of the purely military organisations demonstrates that they must have been treating the sick. Officials of the order mentioned in documents include the master, preceptor and commander and distinction was made between the soldiers and priests. In 1236 Pope Gregory IX gave members permission to wear a half-red, half-white cross on their habits to distinguish them from the Templars (Forey 1977). The order is marked in the north of Montmusard on the mid-thirteenth century map of Acre by Matthew Paris, identified with the words *la maisum de seit thomas le m.* (Cambridge, Corpus Christi MS). This is confirmed by a deed of 1240 concerning the Order of St. Lazarus. This states that the property of St. Thomas of Canterbury lay to the north of the house of St. Lazarus, with both lying between the public road and the sea in northern Montmusard (Comte de Marsy 1984; Regesta Regni 1893 p.285 no.1096). When Prince Edward, son of King Henry I of England, arrived in Acre with a large company of crusaders in 1271 he paid for renovation of one of the towers in the outer wall of the old town (Edwards Tower) and confided its defence to knights in the Order of St. Thomas.

Possible Further Sites of Medical Care

There are a number of institutions referred to in the texts as running a hospitale but where no further information is given to help us interpret the meaning. They might have been used in the medical sense but might just as easily have been referring merely to a hostel where

pilgrims stayed. Some institutions are known to have cared for people with specific diseases, such as the Order of St. Anthony which was established to care for those with ergotism and the Order of St. Lazarus for those thought to have leprosy. While they are known to have run hospitalia in the Frankish states the paucity of records means that it is not clear if these patients were merely fed and washed or if they received any medical treatment. Examples of hospitalia founded by the military orders include the Order of St. Stephen at Jerusalem and the Order of St. Catherine of Campobelli at Acre. References among the religious orders include the Order of Crociferi at Acre and Nicosia, Our Lady of Jehosaphat at Tiberias and Acre, St. Mary Latina at Jerusalem, St. Martin of Tours for Poor Bretons at Acre and the Order of the Trinity at Acre, Beirut and Caesarea. Latin churches which ran hospitalia include the church at Bethlehem, Hebron, Nazareth and the Holy Sepulchre. Eastern churches also possessed hospitalia, such as the Armenian monastery of St. James at Jerusalem, the Greek Orthodox monasteries of St. Catherine at Acre, Jerusalem and Laodicea and also the orthodox monasteries of St. Theodosius at Ascalon, Gibelet, Jaffa, Jerusalem and Nicosia (Amouroux 1999; Coureas 2001; Richard 1982).

Capacity of Frankish Hospitals

Since a small number of these hospitals have been excavated, an interesting approach is to attempt an assessment of their patient capacity. Medieval estimates of inpatients in Frankish hospitals vary quite considerably and none of the chroniclers actually counted the numbers accurately. Estimates of numbers in the hospital of St. John for sick poor in Jerusalem include 'over 1000' by Theodorich in 1169 (Theodorich 1988 p.287) and '2000' by John of Würzburg a decade before (John of Würzburg 1988 p.266). There might also have been a tendency for chroniclers to overestimate numbers in their grandiose descriptions, to

make their accounts more exciting for those hearing the details back in Europe. There are two areas in which some meaningful investigations can be made. The first is the maximum number of patients which a building could physically cope with in extreme circumstances, such as during epidemics or after nearby battles. The second is the approximate number of patients a hospital might have been able to comfortably accommodate in normal circumstances. Two excavated hospitals are to be studied. The first is the small, relatively simple hospital of St. Mary of the Germans in Jerusalem. The other, also in Jerusalem, is the much larger and more elaborate hospital located in the complex of the Order of St. John. These two hospitals provide an interesting comparison because of their differing size and role. It also allows an assessment of the accuracy of inpatient numbers recorded in contemporary chronicles.

One method of estimating this hypothetical maximum number is by determining how many times an average medieval person could fit into the available floor space. This presupposes a number of factors, not least that beds were not used in these circumstances, as they would tend to be a less efficient use of floor space. It also presumes that any equipment or belongings were either stored elsewhere, on the walls, or were slept upon so that it did not take up any extra floor space. This is limited to estimates of the numbers which could be housed in the hospital building itself. It may well be that any overflow might have been accommodated in adjacent buildings such as the associated church, hospital staff accommodation or function rooms. Furthermore, it is unknown how much of the hospital floor space would have been taken up by fixtures which have decayed with time and left no evidence of their existence. There may have been areas for the storage of medical equipment or documents, fireplaces, perhaps tables from which food was taken to patients and even an equivalent of the modern nursing station from which the sick could be observed. The size of these areas cannot be accurately calculated, but they must be taken into account when interpreting any figures.

It might be expected that in extreme overcrowding people would lie on the floor wherever they could find space. In order to find out how much space each would occupy, it is necessary to determine how large any average medieval adult was. Anyone who has hit their head on the top of a thirteenth century doorway might presume that the population in the medieval period were significantly smaller than those today. However, study of medieval human skeletal remains from various parts of Europe has shown that average height was only a little less than in modern times. Length of long bones in the limbs has been shown to correlate with reasonable accuracy with the overall body height. A number of formulae have been derived which allow inference of total body height from this long bone length (Trotter 1958). Using this approach, values for average estimated height in medieval Franks in Europe are in the region of 1.66m (5 foot 5 1/2 inches) for males and 1.56m (5ft 1 1/2in) for females (Martin 1959). AngloSaxons are thought to have been of comparable size, with averages estimated at approximately 1.68m (5ft 6in) for males and 1.57m (5ft 2in) for females (Munter 1936; Kunitz 1987). In comparison, the average height of modern adults in the United Kingdom is 1.74m (5ft 8 1/2 in) for males and 1.61m (5ft 3in) for females (Knight 1984).

Hospital of St. Mary of the Germans in Jerusalem

1) Maximum capacity in extreme circumstances

To determine how many people could have been accommodated on the bare floor, the area of available floor must be calculated. The hospital's internal dimensions of approximately 22.5m (74 ft) by 10.5m (34 ft) give an area of 236.3m^2 (2543 ft^2). However, a number of areas represent 'dead space,' being taken up by stairs (6.8m^2 / 73ft^2) and columns (10.4m^2 / 112ft^2). This leaves theoretically available floor space of roughly 219m^2 (2,357

ft^2). This would obviously be further decreased in practise by an indeterminable amount by the factors discussed previously, such as treatment facilities.

Taking this theoretical, maximal figure of $219m^2$ (2,357 ft^2) the approximate number of patients can be calculated by dividing by the average space taken up by a medieval adult. It is unknown what proportion of children would be present at any time so to attempt to take their smaller size into account would be of little real use. The average height of medieval adult Franks is thought to be in the region of 1.66m (5ft $5^{1/2}$ in) for males and it is reasonable to assume that Germans from the same period would have had a comparable average height, at least to within a few centimetres. An inherent result of many people lying on the floor is an inefficient use of space. There would have been some gaps between people so patients could get to the toilets and staff could distribute food and give medical attention. Allowing for these gaps, an estimate of 1.83m (6ft) by 0.61m (2ft) seems plausible for each patient, which is $1.12m^2$ ($12ft^2$). If the total available floor space is taken as up to $219m^2$ ($2,357ft^2$) then up to 195 adult patients might theoretically fit into the building. Bearing in mind the range of factors which would tend to reduce this, an estimate of the true figure which this hospital could physically accommodate in extreme circumstances might be nearer about 150 adult patients.

2) Capacity in normal circumstances

The hospital would obviously have spent the majority of its life functioning under less strain than the case discussed above. Patients would have been in beds with sufficient space between them to allow access by those taking care of their medical, nutritional, hygienic and spiritual requirements. A number of unknown factors nevertheless remain. The records of the Order of St. John merely stipulate that beds should be big enough for the patient to lie

comfortably (Cartulaire General 1894-1906 vol.1 p.425-9 cart 627). This hospital was subordinate to the Order of St. John in the twelfth century and once independent the Teutonic Order still derived their caring statutes from those of the Order of St. John, it would be expected that comparable provisions were made regarding beds. If the average height of a medieval Frankish male was 1.66m (5ft 51/2in), then it might be assumed that each bed was sufficiently longer than this to accommodate many of that half of the population who was taller than 1.66m.

The hospital was divided into eight bays by the location of arches supporting the function room above. Since there is a small amount of variation between the size of each bay, values for the bay in the south western corner have been used to illustrate each of several possible layouts. The available space measures 4.8m (15ft 9in) by 4.8m. If the beds were 1m (3ft 3in) wide and 2m (6ft 6in) long with a 1m gap between each bed, then six such beds could fit into this bay. The arrangement allows easy passage by staff down the length of the hospital where the arches are at their maximal height. If the bed width is reduced to 0.6m (2ft), then eight beds would fit into the bay with 0.8m (2ft 7in) between each bedside, while still retaining 1m (3ft 3in) between ends. It is also conceivable that two patients could have shared a bed, rather than having one each. In this case, one possibility is four beds 1.5m (4ft 11in) wide by 2m (6ft 6in) long, with 0.9m (2ft 11in) both between each bedside and also between the bedside and adjacent wall allowing sufficient access to the patient in that half of the bed. This would also accommodate eight patients per bay, as did the second scenario of eight small single beds. It is unlikely bunk beds were used as no medieval hospital representations illustrate this concept this early, while art displaying single and double beds is well known.

Extrapolating each possibility to the entire hospital faces some difficulties. The stairs mean that only two or three beds could have fitted into the north western bay, depending on

their size. It is possible that one end of the hospital was for men and the other for women, perhaps with a dividing screen between arches. If thin, it might not have actually had any effect on bed numbers, but if thicker it may have limited access to adjacent beds. There is also the matter of the location of medical stores, nursing station and perhaps a fire. Allowing for the stairs but not the other less quantifiable confounding factors, a theoretical estimate of the number of patients in each scenario can be made.

If there are six single beds in each bay with only three by the stairs, then up to forty five patients might have been present. If eight smaller single beds, or four double beds, were in each bay, then up to sixty patients might have been cared for. The confounding factors already mentioned would make these figures smaller, so that in reality patient numbers in the region of thirty five to fifty might be more realistic.

The hospital of St. John for sick poor in Jerusalem

Using the same approach as was applied to the hospital of St. Mary of the Germans can give an idea as to the capacity of the ground floor of the hospital for sick poor of the Order of St. John in Jerusalem. This building was very much larger than St. Mary so the margins of error associated with any estimation will be correspondingly larger too. Even after the calculations for this thirty eight bay area, the true capacity of the entire hospital remains a mystery. The site itself is long since covered with buildings and our only records are from plans of 100 years ago with inexact measurements. The report describes a number of large, robust piers capable of supporting at least one upper floor, but there is no evidence for its function if it did indeed exist. Further compounding the area is the evidence in contemporary texts (Kedar 1998; Edgington 1998) which record that the women were cared for in a separate building to the men. However, a crude assessment of the part of the complex of St. John that we know

for sure was used as a hospital can give an indication of its patient capacity.

1) Maximum capacity in extreme circumstances

The available floor space is difficult to calculate for this case as only approximate figures are available for the original excavation. The internal dimensions of the main body of the hall are believed to be 70m (230ft) by 36.5m (120ft) and to this must be added the six bay extension in the region of 15m (50ft) by 18m (60ft). This total area of 2825m^2 (30,600ft^2) must be reduced by the area of the piers (24 complete, 26 half and 5 quarter piers), each about 1.2m (4ft) across, which themselves take up an area of roughly 55m^2 (600ft^2). The available area of 2770m^2 (30,000ft^2) could in theory accommodate anything up to 2,500 recumbent adults taking up 1.12m^2 (12ft^2) of floor space each. In practice this figure would obviously be reduced by the factors discussed with regard to the hospital of St. Mary of the Germans, so that perhaps 1,500-2,000 might be a reasonable estimate. Further complicating the issue, it is known that members of the order gave up their beds for the sick in times of overcrowding, with the effect of increasing capacity further. The figure of 1,500-2,000 adults in extreme circumstances is by no means claimed to be accurate, but is merely a crudely derived figure which gives a rough idea as to the capacity of the structure.

2) Capacity in Normal Circumstances

Using the same bed sizes and also the same preconditions applied to the German hospital of St. Mary, the crude estimate of patients in this building under normal conditions raises some interesting points. A typical bay measures between 7.5m and 9m each side (25-30ft by 25-30ft) which can hold twelve wide beds with generous spacing between or eighteen narrow beds with narrow spaces. Multiplied by the thirty eight bays and allowing for some space

devoted to uses other than for patients, this suggests a capacity in the region of 400-650 beds for this building. Bearing in mind the location of women elsewhere and the possibility of other floors, estimates by contemporary chroniclers of 1-2,000 beds in the hospital altogether are by no means out of the question and should not be dismissed as wild medieval exaggeration (Miller 1978; Luttrell 1994). Indeed this was comparable with a number of Islamic hospitals of the time. Independent assessment of this same problem has been undertaken by Benjamin Kedar (Kedar 1998), who published his own figures after these calculations were performed. He used a slightly different technique by using the floor area reserved per pilgrim travelling by ship to the Frankish states in the thirteenth century, rather than using measurements derived from the people themselves. The findings are broadly similar and suggest about 900 single beds, the figure being slightly higher as the calculation only allowed for 18 inches between each bed which would have been extremely cramped.

Dietary Modification

Dietary modification appears to have been a ubiquitous treatment in the medical management of the sick. In medieval medical texts it was regarded as a fundamental technique when attempting to correct the humoural imbalance believed to be responsible for most disease. To understand how Frankish hospitals modified the diet of their patients it is necessary to be aware of the normal foodstuffs in the everyday Frankish diet. Archaeological excavation of sites such as the Red Tower (Hubbard 1986), Belmont Castle (Croft 2000) and the complex of St. John in Acre (Mitchell & Huntley, in press) has found remains of the seeds and pollen of wheat, barley, rye, peas, beans, chick peas and lentils. Animal bones with butchery marks included chicken, goose, pigeon, fish, sheep, goat, cattle, pig, donkey and deer. Historical evidence demonstrates the export of many foods from Europe to the kingdom of Jerusalem

by sea. Foods of vegetable origin included wheat, barley, legumes, chick peas, walnuts, wine and oil while animal products included salt meat, fish, cheese and livestock such as hens and pigs (Pryor 1988). Interestingly, the evidence for diet in the latrines of hospital of St. John differs significantly from that of the general population. For example, no legumes were recovered from the hopsital's latrines while they are a common finding in the excavation of secular farming sites. However, the foods identified in the hospital latrines were all permitted by those sections of the orders statutes that advise on the food that was allowed to the sick. This suggests that the order of St. John was implementing its dietary regulations with regards to the treatment of the sick. By demonstrating the application of dietary modification at the hospital of St. John, this is the first time archaeology has been used to prove that such a medical technique was being employed in the medieval period (Mitchell, Huntley & Stern submitted).

The advice found in the statutes of the Hospitallers, Templars and Teutonic Order is very similar (see tables 1 and 2). All forbid the sick to be given cheese, lentils, unshelled beans and eels or salt fish. Some of the orders also forbid further foods, mainly meats, but no list contradicts that of another order. None of the foods encouraged for the sick in the Hospitallers statutes is forbidden by other orders. Past research on diet in Frankish hospitals (Sterns 1983) has noted a similarity in the dietary rules of the military orders and the *Regimen Sanitatis Salernitanum* (Regimen Sanitatis 1953). This was a text derived from selectively editing and adapting information in those larger medical texts written in the Islamic world that had been translated in Italy during the eleventh, twelfth and thirteenth centuries (Sotres 1999). For example, the Salerno *Regimen* is in agreement with the Frankish medicomilitary orders in forbidding sick cheese, lentils, unshelled beans and eels/salt fish. In consequence, it has been argued that European/Salernitan medical philosophy was dominant in Frankish medical practice, with little influence from Byzantine or Islamic traditions (Sterns

1983). However, a considerable number of these regimens of health had been written by the medieval period (Mauron 1986; Sotres 1998) and the study did not assess comparable dietary advice in eastern medical texts from Byzantine and Islamic regions adjacent to the Latin East. If the Frankish hospital diet is compared not only with the Salernitan text but also other western authors such as Theodorich Borgognoni and eastern authors such as Moses Maimonides and Oribasius of Pergamon a more balanced assessment is possible. The dietary advice in the *Chirurgia* of Theodorich Borgognoni discusses foods that encourage wound healing (Theodorich Borgognoni 1955 p.92-3). While written in Italy in the 1260's, the author states that it is record of the views of his mentor, master Hugo of Lucca who lived from about 1160-1257. This period spans the time when the Frankish records on diet originate. Maimonides wrote his Regimen of Health in Cairo between 1193 and 1198 (Bar-Sela 1964) and gives plenty of advice on the use of diet to treat disease. This text is from also from an identical time period to the manuscripts of dietary regulation in the Order of St. John. The Byzantine example used for comparison is the earlier (4th century AD) text of Oribasius of Pergamon (Oribasius 1997), which was a standard text in the Byzantine world for many centuries. It was also hoped to use the Tacuini Sanitatis of Ibn Butlan, the eastern Christian practitioner who settled in Antioch in the late eleventh century (Ibn Butlan 1990; Tacuinum Sanitatis 1976; Elkhadem 1990). Unfortunately, his dietary recommendations do not systematically specify whether a particular food should be given to or avoided by the sick, which makes the text of little use for this investigation. While not all texts mention all foods and Theodorich only mentions beneficial foods, a careful study of the four medical texts for items specified in the Frankish order statutes gives an idea of their compatibility with each source. Bearing in mind the shared origins of the various regimens it seems sensible to pay more attention to the ways in which advice differs between regions, rather than on their similarities. With regards to foods to the sick, it is found that both Oribasius and Maimonides

Table 2. Foods Forbidden to the Sick in Hospitaller Orders and Medical Texts

	Hospitallers	Teutons	Templars	Salerno	Oribasius	Maimonides
Fish	eels	salt fish	eels	eels	-	salt fish
	-	-	trout	-	-	-
Meats	pork (summer)	-	-	-	pork (summer)	-
	-	beef	beef	beef	-	-
	-	-	veal	-	-	-
	-	-	mutton	-	-	mutton
	-	-	goat	goat	-	old goat
	-	salt meat	-	salt meat	-	-
Dairy	cheese	salt cheese	cheese	cheese	-	-
	-	-	-	milk	-	-
Vegetables	lentils	lentils	lentils	lentils	lentils	-
	beans	unshelled beans	broad beans	unshelled beans	beans	-
	-	-	cabbage	-	-	-
Fruit	-	-	-	apples	-	-
	-	-	-	pears	-	-

Note: Underlined text indicates a contradiction between Frankish statutes and any medical text.

Table 3. Foods Encouraged to the Sick in Hospitaller Orders and Medical Texts

	Hospitallers	Theodorich	Salerno	Oribasius	Maimónides
Fish	-	-	trout	-	-
Meat	poultry	poultry	poultry	-	poultry
	lamb	-	-	sheep	lamb
	boar (winter)	-	all pork	pork (winter)	-
	kid	kid	-	kid	kid
	-	veal	veal	-	-
Dairy	milk	-	-	-	-
Vegetables	barley broth/gruel	-	broth	-	barley broth
	white bread	-	-	white bread	bread
Fruit	apples	-	-	apples	-
	pears	-	-	pears	-
	plums	-	-	plums	-
	figs	-	figs	figs	-
	grapes	-	raisins	grapes	currents
	pomegranate	-	-	pomegranate	pomegranate
	almonds	-	-	-	almonds
Drink	wine	wine	wine	-	white wine
	syrups	-	-	-	syrups
	oxymel	-	-	-	oxymel

Note: Underlined text indicates a contradiction between Frankish statutes and any medical text.

gave broadly similar recommendations to the Frankish orders. Of particular interest is that there is no contradiction between these eastern authors and the hospital statutes but a number of Salernitan recommendations are completely contradictory to the Frankish statutes. For example, the Salerno *Regimen* forbids the sick milk, fresh pears and apples but these are encouraged in the statutes of St. John. Similarly, the Salerno *Regimen* encourages trout, veal and pork for the sick. However, trout and veal were forbidden by the Templars, and most kinds of pork (sow at any time and boar in the summer) were forbidden by the order of St. John. Interestingly, the details on pork in the St. John statutes specify that boar may be eaten in the winter and the same seasonal recommendation is found in the text of Oribasius, but there is no mention of this in the Salerno Regimen. It is understandable that Maimonides, being Jewish, did not mention pork.

In summary, Maimonides agrees with the Frankish statutes on 14 items and contradicts on none. Oribasius agrees with the Frankish statutes on 11 items and contradicts on none. The Salerno *Regimen* agrees with the Franks on 13 items but contradicts on 5 items, nor does it mention a time of year to eat pork. Theodorich is very similar to the Salerno advice but goes into much less detail. It seems clear that dietary statutes in Frankish hospitals did not directly follow the advice in the Salerno *Regimen.* While the Frankish statutes followed eastern ideas much more closely, it can be seen that they were not copied directly from Oribasius either and Maimonides could not have been the source as it was only written 10-20 years after the relevant statutes of St. John were written. It is accepted that only a limited number of works on diet have been examined and by no means every text from the period has been consulted, but the findings from those discussed are very interesting. The variation between statutes suggests that each institution may have evolved its own regulations and did not merely copy them from other previously established orders. This is surprising as the Teutonic Order is supposed to have adopted the medical statutes of the

Order of St. John. It is possible that the doctors working in the hospitals at the time the statutes were drawn up were asked to record their recommendations. It is known that both European and eastern doctors worked in these institutions. The greater similarities between these statutes and recommendations found in the eastern authors compared with those from the west might suggest that it was local eastern medical ideas, rather than those popular in Europe at that time, that were more dominant in determining diet in the hospitals. If that was the case, then it is just as possible that these eastern influences were dominant in determining other forms of medical and surgical treatment in these hospitals too.

Influences on Frankish Hospitals

A number of authors have speculated as to the predominant traditions which provided the basis for the routine in those Frankish hospitals that provided medical care. Some have proposed the Islamic bimaristan, (Hamarneh 1993; Toll 1998), others Byzantine xenones (Miller 1978; Amouroux 1999) and others still favour European influence from Salerno (Sterns 1983; Riley-Smith 1999b p.30). An impartial comparison between Frankish hospitals and each of these traditions may help to clarify this question.

Byzantine xenones shared a number of similarities with Frankish hospitals. Both were religious Christian institutions attached to monastic orders. Patients confessed their sins on admission while prayer and ceremonies took place regularly. They both provided food, nursing and medical care. Male and female patients were kept separate in different areas of the hospitals. In those cases where sufficient records are known to us (the Pantokrator and the Hospital of St. John), the doctors visited the patients every day. While these similarities might at first sight suggest a conclusive link, there are many contrasts between the Byzantine xenon and the Frankish hospital. In the early years of their foundations, the function of most

Frankish *hospitalia* seems to have been to provide food and accommodation to the poor and medical treatment appears to have evolved only after a number of decades. This would suggest that they were not founded to emulate the *xenon*, but were more similar to the *xenodocheion*. Once medical treatment did become standard in the Frankish hospitals, there were considerable differences between Frankish and Byzantine practice. The patients in the Pantokrator appear to have been just those who were acutely unwell and in need of active treatment but only the minority of patients in Frankish hospitals were like this. Most were poor, hungry, feeble and weak but not necessarily acutely sick. In consequence, the doctor patient ratio in the Pantokrator was much higher that in the Order of St. John, who employed just eight doctors for perhaps a thousand people in the 1180's. Doctors in the Hospital of St. John did not work alternate months in the hospital for poor pay and make up for it with a month of private work as was the case in some xenones, but worked exclusively for the hospital for a generous wage. By the 12th century xenon directors were often doctors but the administrators of Frankish hospitals were not. Monks from monasteries that possessed a xenon did not themselves work with patients as hired employees did this, but brothers of the military orders were required to nurse the sick. There is evidence that some xenones did not function to care long term for untreatable patients but the Order of St. John prided itself on giving equal care to hopeless cases as to those who were recovering. Some xenones (such as the Pantokrator) appear to have allocated patients to wards depending on the condition with which they suffered. While the Order of St. John did have distinct wards and the Templars did temporarily segregate patients whose illness made them noisy, smelly or disruptive there is no evidence that an organised approach to patient distribution took place on admission. It seems that despite sharing some similarities, Frankish hospitals were certainly not a direct copy of the Byzantine xenon.

Islamic hospitals also share a number of factors with their Frankish counterparts.

They both provided food, nursing and medical care to the sick. Male patients were kept separate from female. Funding was often from a combination of income from lands granted to the hospital and gifts from wealthy patrons. Ibn Jubayr must have also noted these similarities as when he saw the Frankish hospitals at Acre and Tyre in 1184 he thought that they were, 'after the model of the Muslim hospitals' (Ibn Jubayr 1952 p.346). However, he did not comment on how similar the Frankish institutions were to those existing in the Byzantine world or latin Europe at that time so it is not possible to conclude from this that the Islamic hospital was the original inspiration. In any case, there are a number of marked contrasts between Muslim and Frankish hospitals. While Islamic hospitals were fundamentally secular institutions, Frankish hospitals were typically run by a monastic religious order. Sometimes a bimaristan (such as the Mansuri) allocated patients to a certain area by their type of illness, while Frankish hospitals typically did not. Where evidence exists, Islamic doctors were not employed exclusively in the hospital but saw their patients intermittently during the week between visits to their other patients in their homes, while doctors in the Order of St. John performed daily ward rounds and worked exclusively in their hospital. With such differences between Frankish and Islamic hospitals, it is hard to propose that the Frankish institutions were a direct copy of their Islamic counterparts either.

Hospitalia and infirmaries in Europe again share many characteristics with Frankish hospitals. In the early years of the Frankish states the Order of St. John provided spiritual and nursing care to weak, frail and hungry pilgrims and poor locals in just the same way as *hospitalia* did in Europe. At this stage it cannot be said to be a unique institution as seen from European eyes. By the second half of the twelfth century it had became very large and could house perhaps as many as 1-2,000 people and therefore would have been considerably bigger than the typical European hospital. By the 1180's doctors were employed to treat the bodily illnesses of the patients, complimenting the spiritual and nursing care given previously. This

would have been surprising if it was a secular institution, but since the hospital was part of a monastic organisation the hiring of doctors for intermittent visits was common back in Europe and so not too unexpected here. In contrast to the situation in Europe, however, these doctors worked full time rather than just visiting the sick when requested by the infirmarian. The dietary advice for the sick recorded in the statutes of Frankish orders demonstrates the common heritage between European, Byzantine and Islamic philosophies on the ideal diet but details are more compatible with eastern influences than that of Salerno.

It appears that the Frankish *hospitalia* and *infirmaria* were similar to their European equivalents in the early years after conquest but as the decades passed they evolved to meet the needs of their unique situation (Edgington 2000). The belief in medieval Europe that Jerusalem was the place where heaven and earth intersected meant that many went there to die as they thought that salvation was assured (Ward 1982). The range of establishments may in part be explained by the mixed racial composition of the Frankish states, where many languages were spoken and the sick needed to be able to communicate clearly in their own tongue. Some became very large to cope with the sheer volume of people, such as the Order of St. John. A number hired doctors either part time or full time, such as the Order of St. John, the Templars, Teutonic Knights and Order of St. Thomas of Canterbury. The significant number of weapon injuries sustained by the Franks may well have been the reason for the employment of specialist surgeons in the hospital of St. John by the 1180's. The doctors employed were not just from Europe but also included those indigenous to the eastern Mediterranean, and these were not necessarily all Christian. Details of dietary advice varied slightly between Frankish orders showing that they did not all copy the oldest institution, while the overall pattern appears to be more similar to eastern dietary principals than that of the west. One possibility that might explain this is if the doctors employed by each institution at the time the statutes were drawn up were responsible for giving the advice

recorded. The similarities seen between Frankish, Islamic and Byzantine hospitals do not suggest that Frankish institutions were a direct copy of either. Those similarities are likely to be due to the fact that some aspects of the service provided were common to all three and eastern doctors working in Frankish institutions would have been aware of how Greek and Islamic hospitals functioned. However, Frankish hospital infirmaries certainly did evolve from merely giving food and spiritual care to the sick to providing a more substantial medical service and it seems most plausible that it was influence from local indigenous doctors that was responsible for this. In consequence, the evolution in Frankish hospitals probably resulted from the social and religious need to care for the large numbers of sick pilgrims coupled with easy access to local medical practitioners who would have been able to suggest the military orders adopt the relevant practices employed in eastern hospitals at the time. Those aspects of Byzantine and Islamic hospitals not adopted were either culturally or religiously irrelevant to the Franks. Those practices that were incorporated into hospital life were regarded by contemporaries as being for the practical benefit of the pilgrims and Frankish population.

Conclusion

The medical care of the sick and wounded in the Frankish states within institutions is one of the most interesting aspects of Frankish life. These hospitals and infirmaries were recognised by contemporaries both in Europe and the Middle East for the good work they performed. In the early years they mirrored the services provided back in Europe, concentrating on providing food and a bed with nursing care in a religious environment often referred to as medicine for the soul. As the decades went by the function evolved to include medical treatment of the sick by trained practitioners.

Field hospitals began to become prominent from the 1180s, when the order of St. John ran a mobile wound treatment centre that accompanied the army. It was staffed by the surgeons based in the order's hospital in Jerusalem and treatment took place in tents transported on pack animals. In the Third Crusade, two further field hospitals were established by German and English troops and were established spontaneously to cope with the injured during the long siege at Acre. These later evolved into hospitals within the city after its capture.

The Order of St. John made the greatest contribution to medical care within hospitals in the Frankish states. The principal establishments were at Jerusalem and later at Acre, but care of the sick is also referred to in Nablus, Limassol and Tyre. In the early years spiritual and nursing care were the predominant functions. However, by the 1180s detailed records confirm the therapeutic use of dietary modification, drugs, bloodletting and surgery under the direction of well paid doctors who performed twice daily ward rounds. In contrast to the Order of St. John, the Templars ran an infirmary that was solely for the benefit of members of its own order. This was necessary to keep its fighting force up to strength. The Teutonic Order and the Order of St. Thomas of Canterbury provided medical care to those German and English pilgrims who were wounded in battle or fell ill while in the east. Inpatient capacity of two excavated Jerusalem hospitals, that of the Order of St. John and St. Mary of the Germans, has shown that medieval estimates of inpatient capacity were not wild exaggerations but reasonable figures. The excavated areas of the hospital of the Order of St. John might have held about 400-650 single male beds, with women cared for in a separate floor or building, while the much smaller hospital of St. Mary of the Germans might have looked after about 35-50 patients. Details of dietary modification in the statutes of the medicomilitary orders show a complex regimen of encouraged and forbidden foods. Details in each order vary sufficiently to suggest they were not merely copied from the oldest

institution but established separately, perhaps on the advice of the doctors employed by each institution at the time the statutes were recorded. They show more similarity with eastern medical texts than those written in Europe, suggesting the dominance of local influences on treatment rather than reliance on the teachings of Salerno. Other comparisons between hospitals in Europe, the Byzantine and the Islamic worlds suggest that while the Frankish hospitals were initially founded to be similar to hospitalia back in Europe, they gradually evolved to meet the functional requirements of the unusual situation of the Latin East by incorporating local ideas on medicine. This resulted in the provision of medical care not normally found in European hospitalia while still providing accommodation and food to pilgrims which was not characteristic of Byzantine or Islamic hospitals. The Frankish medical hospitalia discussed here might perhaps be thought of as hybrid institutions that evolved from those aspects of hospitals from the three cultures that were most useful to their society. This novel combination gradually fused out of necessity rather than following a preconceived design, as was the case in so many aspects of Frankish life.

Trauma and its Treatment in the Crusades

Trauma surgery understandably comprised a major part of the surgical workload for practitioners in the Latin East. A significant number of battles, sieges, raids and expeditions took place throughout the two hundred year history of the Frankish states. Even discounting the effects of fighting, the Latin East may have been a rough and rowdy place on account of the criminals and bad characters who were sent there by courts in Europe in the hope that spending time at the holy places might reform their character (Hurnand 1969). We hear of, 'many sinful as well as pious men, adulterers, murderers, thieves, perjurers and robbers' who set out on the First Crusade in 1096-7 (Albert of Aachen Bk1 Ch2). In 1253 the Papal legate Odo of Chateauroux told Lord Joinville 'no one knows as well as I do the wicked sins that are committed in Acre' (John of Joinville 1955 p.181). The legate also noted that Christians who fled Europe to Outremer hoping to find less opportunity to sin discovered there more occasions than at home, and where they expected to be sanctified they were further corrupted (Innocent IV 1876 p.220). While it may have been called the Holy Land, not everybody behaved in a holy way.

It might be presumed that the most logical place to look for textual evidence of the treatment of the injured would be medical texts. This approach has been used either on its own (Haddad 1986-7; Perrot 1988; Frohberg 1989) or in conjunction with independent evidence for injuries (Paterson 1988; Mitchell 1999) to determine how these injuries might have been treated. One difficulty with this technique is that there are no European surgical texts from the earliest days of the Frankish states and so assessing both early practice and also the evolution of techniques over the decades is problematic. Clearly not all medieval surgical texts are equally applicable to all events within the entire life span of the Frankish

states and so a late thirteenth century text has only limited compatibility with an early twelfth century treatment episode. Furthermore, there has been considerable debate as to how to interpret the content of surgical texts in the medieval period and to what degree it can be assumed that practitioners actually performed the procedures found in these works (Alvarez-Milan 2000; Savage-Smith 2000). Sometimes the wording of a medical text uses practical examples that give the impression that it was written primarily to be used to treat the injured (Paterson 1988) and other times the inclusion of new techniques suggests that they were practiced by the author who recommended their use. However, some texts merely repeat procedures word for word that are found in much earlier works and there may be no evidence that the author even saw such a procedure, let alone performed it themselves. One method applicable to the treatment of weapon injury is to study original works on how to maintain health in an army, such as Arnold of Villanova's *Regimen Almarie* (McVaugh 1992), as discussed earlier. New techniques or information might imply that they were in use at that time rather than merely copied into a text from ancient sources for completeness. Another more rather impartial technique to assess the actual practice of surgery is to use anecdotal information in non-medical contemporary sources where procedures are referred to. While this would by no means be guaranteed to give evidence for all the surgical procedures that were actually undertaken at that time, with a large enough range of original sources a rough estimate of typical procedures may become apparent. Of course not all of the surgeon's trauma workload was the treatment of battle casualties. Even in peacetime farmers would have fallen off carts and masons been hit by falling stones, many needing the attention of a *medicus* or *cyrurgicus* if one was available. Some interesting work on such accidents in children has been undertaken using evidence from the miracle cures of saints in medieval England (Gordon 1991). Typical injuries included lacerations, contusions, fractures, burns and asphyxiation. However, such trauma rarely attracted the attention of most general chroniclers

so that the majority of information regarding the crusades refers to the battlefield.

Injuries resulting from trauma can be subdivided by the mechanism of injury and the part of the body effected. This simplifies matters as knowledge among doctors of the function of different parts of the body varied widely. Medical texts discussing human anatomy date back well before the medieval period. Alexandria in Egypt is known for the dissections that took place there in Ptolemaic times around 250-300 BC (Scarborough 1976a). Perhaps the most significant single contribution was from Galen in 2nd century AD Rome, who dissected animals such as the pig, ox, dog, bear, barbary ape and other animals (Savage-Smith 1971a; Savage-Smith 1971b; Persaud 1984 p.57-69). The Roman Empire continued in the east as the Byzantine Empire and human dissection is known to have taken place there over the following centuries (Bliquez 1984; Browning 1985). Examples come from the fourth to twelfth centuries and were typically the cadavers of condemned criminals. Dissection was undertaken specifically to understand human anatomy in order to treat the sick more successfully. With the rise of medicine in the Islamic world a number of medical texts incorporated the anatomical knowledge from Galen and others. While there has been much misunderstanding with regards to the role of human dissection in medieval Islam (Savage-Smith 1995), there was certainly no prohibition against the dissection of animals to further anatomical understanding. Although Galen was well known in the Middle East by the time of the crusades, some of Galen's anatomical works were not known in Europe until the 1500's (Singer 1956). However, a number of those Arabic texts that had incorporated his discoveries did find their way to Europe and translations of these began to become available from the eleventh century onwards. The most notable works include the Isagoge of Hunayn, the Canon of Avicenna, the Liber Pantegni of al-Majusi and the book of the Almansor by al-Razi (Siraisi 1990). Knowledge of the anatomy of higher mammals advanced significantly in southern Europe from the eleventh to thirteenth centuries with a number of texts which describe how

to perform dissection of the pig. Perhaps the earliest is the *Anatomia Porci* (Corner 1927; O'Neill 1970) and a number of comparable works were subsequently produced in Italy (Corner 1927; Saffron 1975; French 1999). Illustrations of human dissection have also been identified in a medical manuscript thought to have originated in thirteenth century England, perhaps at St. Albans (MacKinney 1960). Organs clearly drawn in the female cadaver include the heart and lungs, liver, kidneys, intestines and ovaries. An interesting parallel is found with the wounding of King Baldwin I of Jerusalem around 1103, described in more detail below. Here his doctor asks for permission to give a Saracen prisoner a similar wound and then dissect him to aid in the treatment of the king, but instead a bear was dissected as a compromise (Guibert of Nogent 1997 p.134). By the late thirteenth century post mortem examinations were being undertaken in Italy for forensic purposes to help identify cause of death (O'Neill 1976; Sinha 1982). Human dissection became more widespread in the teaching of medicine in the fourteenth century (on the cadavers of criminals) (Siraisi 1990) and illustrated anatomical works were written by Henri de Mondeville, Mondino dei Luzzi and others (MacKinney 1962; Olry 1997). Another source of anatomical knowledge would have been the procedures undertaken when an individual died away from home and wished for their remains to be transported to a specific burial place. This appears to have been a common practice in the twelfth and thirteenth centuries, at least among the nobility. The practice involved either boiling the body to retrieve the bones for transport or full dissection of the body so that important organs such as the heart were placed in a casket while the eviscerated cadaver was packed with salt or other preservatives for the journey home. While this practice did happen all over Europe until the decree of Pope Boniface III in 1299, it was still allowed after this date if the death occurred outside Christian lands (Brown 1981). Clearly the crusades were a classic example of where nobles would die far from home and there are many examples of this preservation and transport home of Franks, such as King Baldwin I of

Jerusalem in 1118, Emperor Frederick I of Germany in 1190 and the English Earl of Arundel in 1221 (Albert of Aachen bk12 ch28; Continuation of William of Tyre 1996 p.88; Matthew Paris 1876, vol.3 p.67). This must have given those crusaders performing the preservation a reasonable knowledge of the anatomy of much of the human body. It seems that at the time of the crusades many of those practitioners with an academic medical training would have had a basic knowledge of mammalian anatomy from both texts and dissections of the pig and others may have gained hands on experience of human anatomy either from forensic dissection or preservation of the dead for transfer to a preferred burial location. However, the anatomical knowledge of many of the less well educated practitioners would probably have been rather limited and none of them appear to have known the correct function of many organs, especially in the thorax and abdomen (French 1978).

Evidence for injuries and their surgical treatment in the Latin East is outlined below with representative examples. The nature of using these texts means that care must be taken to use historically plausible accounts and avoid taking everything at face value. It is hoped that the legends and more outrageous stories have been either excluded or highlighted as such, and that those authors known for their active imaginations have been used with appropriate caution. At the siege of Antioch in February 1098 there was a battle between the besieging Franks and the Turks who came to relieve the city. Orderic Vitalis (Orderic Vitalis 1975, 5, p.81) wrote, 'Weapons were shattered everywhere and bright sparks flew from brazen helmets. Wound after wound was inflicted and the fields were red with blood. You could see torn entrails, severed heads, headless bodies, corpses everywhere.' While such detail might at first glance seem to suggest his personal participation in the campaign, this is far from the case. Orderic wrote his chronicle from the comfort of his French monastery several decades after the crusade, used other written accounts as his sources rather than eye witnesses and he himself never even went to the Frankish states. It is probable that this is an example where

description of battle scenes were fabricated in a way plausible to the reader to make the story more exciting, as occurred in Greek and Roman epics (Salazar 2000). A discussion of the types of weapons and armour used and numbers of casualties in battle enables those injuries described in more reliable accounts to be seen in context. These wounds have been grouped together under crush injuries, blade injuries, penetrating injuries from arrow and lance, burns and head injuries. Cranial trauma is dealt with separately as the complications and treatment was similar regardless of the weapon used to cause the injury. The final evidence is the surgical treatment given to treat the complications of malnutrition in the army camp. Where possible the information is identified as representing either crusader or local medical practice, the latter being performed by either Frankish settlers or those Christian, Jewish or Muslim practitioners indigenous to the region. This may highlight any apparent differences between those from contrasting backgrounds. The evidence is then evaluated in an attempt to highlight which injuries were most common and which were the most serious. We will also be in a position to determine what kinds of surgical procedures were actually being undertaken at that time in the management of trauma and how closely this resembles the recommended treatments found in contemporary medical texts.

Number of Casualties in Battle

It is possible to make very approximate assessments of the fate of those involved in major battles or sieges based on the information recorded in contemporary chronicles. Sometimes actual figures are given (Walter the Chancellor 1999 p.155; Richard de Templo 1997 p.25) but it is obvious that these have to be treated with caution as there is potential for an author to massage the figures up or down to make the engagement sound more impressive for his own side (Bachrach 1999). A more objective approach is to determine the fate of individuals

known to have been present at a certain battle. This can be useful when looking at the more important nobles or clergy, who tend to be mentioned by name, but of little help in assessing the fate of the common foot soldier. The *Itinerarium Peregrinorum et Gesta Regis Ricardi* mentions a number of nobles and clergy by name who joined the siege of Acre which lasted nearly two years, from 1190-1 (Richard de Templo 1997 p.82, p.98). Nobles and clergy would be expected to share many lifestyle factors in common, such as reasonable diet and access to medical care, with the major difference being their role on the battlefield. With a few notable exceptions, clergy did not typically play an active military role so it is likely that most deaths in this group were due natural causes, such as infectious disease and malnutrition. Clearly some of these individuals would have died anyway, even if they had stayed back in Europe (Bullough 1980; Kunitz 1987; Shahar 1993), and ideally it would be useful to know how many extra died due to their participation in the crusade. However, it is difficult to allow for this accurately unless the ages of the clerics and nobles are also available and the age mix of these individuals remains unknown. This technique will tend to underestimate the true death rates as the fate of many individuals is unknown. To err on the site of caution these unknowns have been treated as if they survived, to give a minimum death rate. Of the sixty nine individuals mentioned in the list, eighteen (26%) died at some stage during the siege while the remaining fifty one are believed either to have survived or their fate is unknown. Of fifty nobles mentioned, fifteen (30%) of them are thought to have died in the siege. Of nineteen clergy mentioned, three (16%) are thought to have died. Twice the percentage of nobles died in the same period and one plausible explanation is that the higher number was due to injuries on the battlefield.

A similar approach has been used to look at the situation in the Fifth Crusade to Egypt in 1217-21 (Powell 1986 p.169-71). However, the method differed slightly as only those whose outcome is known (death or survival) are included. This approach may

overestimate the total death rate as a death may have been more likely to have been recorded in a chronicle than survival. Death was a newsworthy fact to note in a chronicle, but a survival would rarely have been so. From a total of 261 named crusaders there is evidence that 89 died at some stage during the campaign (34%). From the upper clergy 9 out of 48 died (19%) while from the feudal aristocracy 35 out of 104 died (33%). This again shows a death rate in the clergy of just half that of the knights and figures are surprisingly similar to those derived from the Third Crusade thirty years before. It is possible that the higher total death rate in this later campaign was a result of the expedition lasting longer, but the bias due to the reporting of deaths and survivals in the chronicles may also be to blame. More recent study of deaths in the First Crusade has estimated that about 37% died in the subset under study (Riley-Smith 2002). This analysis used a slightly different method of calculation. The evidence for the cause of death is not based on the crusaders role (soldier or clergy) but on the information written about the circumstances of their death. This will tend to give a different bias to that resulting from the previous methods described. From a total of 217 named crusaders whose outcome is known, 52 (24%) died in combat, 29 (13%) died from unspecified causes (such as starvation, disease or combat) and 136 (63%) survived. As just discussed for the study of the fifth crusade, this approach may overestimate the total death rate as only those with known outcome were included. It will also overestimate the proportion of deaths due to disease, as some of those who died from unknown causes are nevertheless thought to have died in battle. As with the other techniques, the information is based on that subset of the crusader army who were sufficiently rich, noble or well known to have been mentioned by name. None of these techniques is perfect, but seen together they all contribute to our understanding of the chance of a typical crusader returning home alive.

These findings suggest that in a long campaign with sieges under difficult conditions, at least 15-20% of the wealthy crusaders might have died from disease and at least a further

15-20% of knights might have died in battle. In these upper echelons of medieval society perhaps 25-40% might have died in a tough expedition lasting two or three years. It is not known what proportion of foot soldiers died from each cause and it might be expected that figures would be much higher. More would have died from malnutrition as they would have had little money or food supplies in reserve for hard times. Likewise their poor defensive armour may well have resulted in higher casualties in battle.

Weapons and Armour

Some knowledge of the tactics and weapons used in the medieval period, together with the armour employed to protect against injury, helps in the understanding of trauma at this time (France 2001). Personal weapons known to have been used in the crusades include the sword, dagger, battle-axe, mace, war-flail, war-hammer, lance, spear, arrow and crossbow bolt (Nicolle 1988). Siege weapons were able to propel rocks, Greek fire, boiling oil and water and on occasion, amputated body parts. In defence a typical Frankish knight's protection would have included a coat of chain mail or scale armour, shield and a helmet (Edge 1996; Nicolle 1980). The mail typically covered the head, arms, body and thighs in one piece, known as a *hauberk*. During the twelfth century mail protecting the lower legs, *chausses*, became more common. Although an effective defence, mail could still be penetrated by lance, crossbow bolt and arrow and even cut with a heavy blow from a good sword (Oakeshott 1994; Bradbury 1985). The mace exploited the flexible nature of mail and crushed the bones and soft tissues underneath without having to penetrate the mail. In consequence, padded cloth garments (*aketon*) or rigid leather (*cuirasse*) could be worn under the mail to dissipate the energy from these blows, so decreasing the resulting damage. The shield was changing from the long pointed 'kite' shape of the Normans to become shorter with a flatter top, easier to use on horseback. Helmets in the twelfth century were evolving from the conical shape with a nasal

bar used by the Normans the century before. Their first advance was to become rounded in shape and by the end of the twelfth century the great helm was introduced, which gave protection to the face as well as the skull. A footman was limited in the amount of defensive equipment he could use. This was partially due to the cost, partially that heavy armour greatly limited mobility and partially a consequence of the intense heat in much of the region. They may have worn a helmet, jerkin of padded cloth (*gambeson*) or stiffened leather, possible some mail and sometimes a small shield. It was rare to wear protection for the lower legs. A popular helmet from the end of the twelfth century was the kettle hat (*chapel de fer*). This was rounded over the skull and had a wide brim, which gave reasonable protection while not impairing the field of vision. Although all this equipment was available, often the poorest soldiers went into battle with nothing but a weapon.

In the armies of the Muslim emirs armour obviously varied depending on the origins of the soldiers. Some came from Asia Minor to the north, others from Syria and Persia to the east and others still from Egypt and north Africa to the south (Nicolle 1979). Many Muslim soldiers were well known for their light armour which allowed them much greater mobility. Typical equipment included close quarter weapons such as the sword, dagger, axe or mace and projectile weapons such as the bow, crossbow and javelin (Richard de Templo 1997 p.234; Nicolle 1994). The spear was used by both infantry and cavalry, the latter using the lance as well. Horsemen typically wore conical helmets or a turban and sometimes a combination of the two. Many shields were round or kite-shaped while infantry had the flat bottomed shield which could be used to create a defensive wall in battle (Nicolle 1983). These shields could be made from leather, wood or iron. Some cavalry were heavily armoured with mail or lamellar armour to cover the body, arms and legs comparable to a crusader *hauberk* while others wore just a padded cloth jacket to improve mobility (Williams 1978; Nicolle 1999).

While none of this body armour could protect against the projectiles from the massive

siege engines (Hill 1998) used by all sides, they did help considerably in protecting the soldier from blows from hand held weapons and lighter projectiles such as arrows.

Blade Injuries

Wounds from the sword and battle axe were common and a good archaeological examples has been described from the Frankish settlement of *Le Petit Gerin* (Mitchell 1997) and the castle of Vadum Iacob. The way in which the weapons were so effective at close quarters is highlighted in the following examples of injuries from contemporary chronicles.

In 1097 the armies of the First Crusade won a battle near Nicaea against Kilij-Arslan, the sultan of Rum. Even at this early stage the practice of decapitation and use of the severed head as a trophy was widespread. Albert of Aachen wrote that, 'the Christians cut off the heads of the dead and wounded and as a sign of victory they brought them back to their tents with them, tied on the girths of their saddles' (Albert of Aachen bk2 ch27). When they besieged the city of Nicaea itself these heads were catapulted into the town by the crusaders to frighten and demoralise the defenders. A further use for these heads was that, 'a thousand Turks heads were gathered in carts and sacks and loaded on wagons and they took them down to the port which is called Civitot and then they were sent by ship to the emperor of Constantinople' (Albert of Aachen bk2 ch28). Again this was meant as a sign of their military prowess. Presumably the sight and smell of so many decomposing heads must have had quite an effect when the ship arrived in Constantinople.

In August 1097, shortly after the city of Nicaea was taken by the crusaders, the army came near the town of Antiocheia (west of modern Yalvac). It was here that Duke Godfrey of Bouillon showed off his swordsmanship during an encounter with a wild bear that had attacked a peasant wandering in some woods. 'By an unlucky chance, as the beast was

escaping the blow of the sword it suddenly drove its curved claws into the duke's tunic, it brought him down to the ground embraced in its forepaws as he fell from his horse and it wasted no time before tearing his throat with its teeth. The duke, therefore, in great distress remembering his many distinguished exploits and lamenting that he who had up to now escaped splendidly from all danger was now indeed to be choked by this bloodthirsty beast in an ignoble death, recovered his strength; he revived in an instant and was on his feet and, seizing the sword which had got entangled with his own legs in the sudden fall from his horse and the struggle with the frenzied wild beast, holding it by the hilt he aimed swiftly at the beasts throat, but mutilated the calf and sinews of his own leg with a serious cut. But nevertheless, although an unstaunchable stream of blood poured forth and was lessening the duke's strength, he did not yield to the hostile brute but persisted most fiercely in defending himself until a man called Husechin, who had heard the great shout of the poor peasant delivered from the bear, and the butcher's violent roaring, rode at speed from the comrades scattered through the forest to assist the duke. He attacked the terrifying wild beast with drawn sword, and together with the duke he pierced its liver and ribs with his blade. So, with the ferocious beast killed at last, the duke for the first time began to lose heart because of the pain of his wound and the excessive loss of blood; his face turned pale and he threw the whole army into confusion with the wicked news. Everyone rushed together to the place where the brave champion and man of wisdom, head of the pilgrims, was brought wounded. Laying him on a litter, the chiefs of the army brought him down into camp with great lamentation and grief of the men and wailing of the women, summoning the most skilled doctors to heal him.' (Albert of Aachen bk3 ch4; see also Guibert of Nogent 1997 p.133-4). While Godfrey may have sustained damage to his throat from the bear it sounds as if the worst injury was caused by his own sword after he was pulled from the horse. The laceration appears to have been to one of his calves and the record of heavy bleeding would suggest transection of an artery,

rather than a vein where bleeding would be less. This is supported by the fact that he turned pale, which is a classic sign of shock due to significant blood loss (Committee on Trauma 1994 p.81-2). While the techniques employed by the doctors are not outlined in Albert of Aachen's chronicle, surgical texts from the medieval period do recommend how this kind of injury should be treated. However, it should be remembered that the twelfth century European surgical texts had yet to be written by this time. One early text that might be helpful is that of Albucasis who wrote in tenth to eleventh century Islamic Spain. Although it was not translated into Latin until the 1170's, it should have been known to the eastern Christian doctors who often assisted the crusaders. He describes one interesting technique for stopping arterial bleeding (Albucasis 1973 p.162). 'Very often there occurs bleeding from an artery which has been cut either by an external wound or in opening an abscess or in cauterising a part of the body and so on, and it is difficult to stem. When this happens to anyone, quickly apply your forefinger to it and closing it properly until the bleeding ceases under your fingers and nothing comes out. Then put in the fire several olive cauteries, small and large, and blow on them to make them very hot. Then take one, small or large according to the size of the wound and the size of the opening of the artery and bring the cautery right down on the artery itself, after promptly removing your finger, and hold the cautery upon it until the bleeding ceases.' This treatment would be expected to be effective as the hot cautery would burn the artery and stop the flow of blood through the middle. This was by no means an easy procedure to perform. All the blood pouring from the vessel would make both instruments and body tissues very slippery to hold and it would often have been difficult to see exactly where to place the cautery as the blood welled up from a deeply positioned artery. Furthermore, time was not on the surgeon's side as the duke would have been deteriorating minute by minute. However, from what we hear about the degree of bleeding from his wound we would have expected him to have died from blood loss had the doctors

not intervened with a technique such as this. It was January 1098, a full five months later, before we hear that Godfrey had fully recovered from his wound (Albert of Aachen bk3 ch 58). The duke then continued as one of the prominent leaders of the First Crusade and became the first ruler of Jerusalem after it was conquered in 1099.

Sometimes the frantic slaughter on capturing a town was hard to believe. The details from eye witnesses were often highly graphic. Raymond of Aguilers (Raymond d'Aguilers 1968 p.127) tells us that on taking Jerusalem in July 1099, 'some of the pagans were mercifully beheaded, others pierced by arrows plunged from towers, and yet others, tortured for a long time, were burned to death in searing flames. Piles of heads, hands and feet lay in the houses and streets.' In modern times letting the prisoners go unharmed might be thought of as merciful. The suggestion in this chronicle that mere beheading, without the torture, was merciful does highlight the attitudes that some of the more zealous chroniclers possessed.

There are rare examples of scalping, when a knife was used to remove the hair and scalp from the head as a sign of victory over an opponent. Gervase was in charge of the city of Tiberias in 1108 when he was captured by soldiers from Damascus. As King Baldwin I refused to surrender several cities in return for the knight's life, his captors decided to put him to death. However, Gervase had long white hair which had not been cut for some time and chronicles mention that the scalp was cut off the head, dried and fixed to the top of a spear to remind the Damascenes of the victory and intimidate the Franks in future battles (Albert of Aachen bk10 ch57). The practice of scalping in the region had a long history and archaeological cases from the eastern Mediterranean (Ortner 1997) date back as early as the Bronze Age (3000 BC).

An attempt to assassinate a Frankish noble with a sword was described by William of Tyre (William of Tyre 1943 vol.2. p.74), when in the 1130's 'the Count of Jaffa was awaiting passage and lingering in Jerusalem as he was wont to do. One day he happened to be playing

dice on a table before the shop of a merchant named Alfanus in the street which is called the Street of the Furriers. The count, intent upon the game, had no thought of danger. Suddenly, before all the bystanders, a knight from Brittany drew his sword in a hostile fashion and stabbed the count again and again ..... The count remained for a while in the kingdom, that his wounds might be cared for and his health restored.' We can only speculate as to exactly how these wounds were restored to health. It is presumed that he would have been treated by a Frankish settler or local practitioner as he was not participating on a crusade at the time of his injury. Albucasis recommended that the injuries were cleaned and either bandaged or sutured to bring the wound edges together (Albucasis 1973 p.526-42) and both these techniques work well for an appropriate wound (Brunius 1967). By this time the very limited surgical texts available to educated Frankish practitioners had at least been augmented by the Latin translation of al-Majusi at Antioch in 1127 (Burnett 2000). Other treatments such as modification of diet to promote healing, oral medicines and bloodletting were all likely possibilities in the following weeks.

Usama described an undated twelfth century incident where a Muslim foot soldier attacked some Frankish troops hiding in a cave between Shaizar and al-Ruj (Usama ibn Munqidh 1929 p.106-7). 'Numayr now turned to the man with a sword, intent upon attacking him. But the Frank immediately struck him with the sword on the side of his face and cut through his eyebrow, eyelid, cheek, nose and upper lip, making the whole side of his face hang down upon his chest. Numayr went out of the cave to his companions who bandaged his wound and brought him back during a cold and rainy night. There his face was stitched up and his wound was treated until he was healed and returned to his former condition, with the exception of his eye which was lost for good.' Another very similar injury was described in a Muslim animal dealer who had been fighting the Franks and again a surgeon at Shaizar sewed up the wound to his face and it healed. The man then gained the nickname of

'the gashed one' (Usama ibn Munqidh 1929 p.193). While the descriptions of the face hanging downward might seem at first to be exaggerated (Nicolle 1993) the anatomy of much of the forehead, face and cheeks means that if a sufficiently large wound is made then the skin can easily be peeled away from the bones and deeper tissues (McMinn 1994 p.453-5). It is interesting that these incidents show presumably indigenous surgeons suturing wounds with apparent long term success (see Hauben 1983). From a modern perspective it might be anticipated that suturing with non sterile threads would lead to infection and wound breakdown, but this does not appear to have been the case here.

To control the forces on the Third Crusade in 1189, King Richard the Lionheart introduced laws for the army. Benedict of Peterborough (Benedict of Peterborough 1867 p.110) recorded that, 'Richard's laws for the fleet included drowning or burial alive for murderers, mutilation for those who shed blood and dipping in the sea for those who dealt bloodless blows. The thirteenth century Frankish laws recorded in the *Assises de la Cour des Bourgeois* also mention mutilation as a punishment for a doctor convicted of medical negligence (Assises de Jerusalem 1843 p.164-6). If a free citizen was maimed or disabled from substandard treatment, such as applying poor plasters for a fracture in the leg which then failed to heal straight, then the doctor was to have his right thumb amputated. It is likely that this was to prevent him practicing in the future as it would have been very difficult for any right handed person to perform procedures without a thumb. Archaeological cases of mutilation have been found in a number of medieval period skeletons from northern Europe. A typical punishment would be the removal of a hand or a foot, or both (Brothwell 1963; Mays 1996). The punishment of mutilation for a serious crime was common in the eleventh and twelfth centuries, but was less widely used from the thirteenth century onwards. Amputation was a well practiced operation of the time and all surgeons should have known how to perform it in cases of trauma or gangrene. However, in the case of legal punishment it

is not clear if the procedure would have been performed by a surgeon or by simply severing the limb with a sword or axe followed by cautery to bleeding arteries. It is probable that not everyone would have survived the procedure. The earliest statistics of survival following amputation come from the eighteenth and nineteenth centuries, before the use of antiseptics to kill bacteria. Survival varied greatly between surgeons, the part of the body removed and also on the indication for the treatment. Those with a clean injury appeared to do better than those who already had gangrene. Mortality rates in Paris hospitals during the 1830's averaged 39% for all amputations and rose to 62% of those undergoing thigh amputation. We can only speculate as to whether these figures can be compared to the pre-gunpowder Latin East. The time taken to perform an amputation was also an important factor to minimise the pain from the procedure. In the eighteenth and nineteenth centuries it was standard to take less than a minute to remove the unwanted part of the limb and no more than three or four minutes more to stop the bleeding and complete the procedure (Wangenstein 1967). The method of amputation described by the eleventh century doctor Albucasis (Albucasis 1973 p.562-8) is a reasonable example as by the mid twelfth century the manuscripts were popular both in the Islamic world and also in Europe. He advised first placing the limb on a block of wood. Ligatures were to be tied round the limb above and below the site of amputation to keep the soft tissues out of the way once they were cut through with the scalpel. After the haemorrhage from blood vessels was dealt with, the surgeon should saw through the bone sufficiently high up the leg to ensure only healthy bone remained. The stump was then bandaged until healed, presuming the patient lived that long. An alternative way to undergo amputation was when this occurred in battle. In May 1191 the forces of King Richard I of England attacked a Muslim supply ship which was sailing to the relief of Acre. The descriptions of the location of wounds corresponds well with the archaeological evidence from medieval battlefields, such as the Battle of Visby (Ingelmark 1939-40). The *Itinerarium*

Peregrinorum et Gesta Regis Ricardi recorded how, 'the Turks gained boldness from despair and tried with all their strength to resist the attacking sailors, cutting off here a foot, there a hand and even a great many heads' (Richard de Templo 1997 p.198).

Marquis Conrad of Montferrat was assassinated by the Exchange in the city of Tyre on 28 April 1192. Although there were many rumours as to who was responsible, the most likely appears to have been the Islamic Assassin Sect. 'He had reached the tollhouse when two young Assassins, unencumbered by cloaks, rushed up to him at great speed, stretched out the two long knives which they held in their hands and stabbed him this way and that in the stomach, mortally wounding him, before running off at full speed. The marquis at once fell dying from his horse..... The marquis was already drawing his last breath. surrounding him, his entourage lifted him gently in their arms and carried him to the palace..... Then almost at once he died and he was buried at the Hospital' (Richard de Templo 1997 p.306-7). He appears to have died too quickly for infection from his damaged bowel to have led to peritonitis. A swift death like this from a penetrating injury to the abdomen is most likely to have been due to uncontrollable blood loss from damaged blood vessels or organ such as the liver or spleen. The laws of the kingdom of Jerusalem specifically cover the problem of assassination or murder by stabbing. In the *Assises de la Haut Cour* it is stated that the total number of people charged with the murder could not exceed the number of stab wounds (Kirsch 1969). A further refinement of this concept can be seen in the laws of Bologna from 1265, where the total number charged could not exceed the number of stab wounds in fatal parts of the body, as opposed to superficial wounds in less important areas (Simili 1973). In some countries or time periods it was doctors who had to assess deceased stab victims (Amundsen 1979; Simili 1973) but in the kingdom of Jerusalem it could be any free men and no medical training was required.

At the Battle of Mansourah in February 1250 in Egypt, Lord John of Joinville

describes (John of Joinville 1955 p.80) some of the facial wounds his comrades received. 'There my Lord Hugh of Ecot was wounded by three lance thrusts in the face, my Lord Raoul too ..... My Lord Erard of Siverey was struck by a sword across the face, so that his nose fell over his lip ..... he died of that wound.' After capture by the Egyptian forces in April 1250, John of Joinville (John of Joinville 1955 p.105) tells us, 'Lord Raoul of Wanou, who was in my party, had all the muscles at the back of the knees cut through in the battle of Shrove Tuesday and was unable to stand on his feet; and I should tell you that an old Saracen knight, who was in the galley, used to carry him to the latrine hanging from his neck.'

Prince Edward of England was in Acre during 1272, where he was attacked by one of the Assassin Sect (Chronique de Primat 1894 p.84; Hayton 1906 p.228). From Matthew Paris (Matthew Paris 1854 vol.3 p.379) we hear, 'the Assassin wounded him twice in the arm and a third time under the armpit. Edward at once hurled the Assassin to the earth with his foot and, wrenching the knife from his hands, slew the villain with it. In wrestling away the knife, however, he wounded himself severely in the hand and as the poison entered and spread in the wounds, they were only cured with great difficulty and by the application of many and various remedies.' The local Chronicle of the Templar of Tyre (Templar of Tyre 1887 p.201) added that the, 'lords assembled and summoned all the doctors and assistants, who sucked the wound and drew out the poison.' It cannot be known for sure if a poison was used on the knife as there is no mention of the symptoms which resulted from it. However, poisons thought to have been in use for arrows and knives in medieval Europe and the Middle East (Bisset 1989) include plant extracts from the white hellebore *(Veratrum album)* and possibly aconitum *(Ranunculaceae sp.)* and henbane *(Hyoscamus niger)*.

Penetrating Arrow and Lance Injuries

Both these weapons have effectively the same function, being a wooden shaft with a sharp metal point which could penetrate certain types of armour and pass deep into the body. The tips of some had barbs which made their removal difficult while others were without barbs. The absence of barbs made the penetration of armour easier and, in the case of the lance, enabled the horseman to use the weapon repeatedly. While the obvious differences between the two are the larger scale of the lance and the fact that the arrow could be used from a distance while the lance was hand held, the injuries caused by both of these weapons would be have been similar. They caused a deep, penetrating injury while leaving only a small wound in the skin. The result was that it would have been difficult for a surgeon to explore the wound to assess the degree of internal damage without enlarging the wound himself and perhaps worsening the situation. If the arrow could not easily be pulled out the way it went in, medical texts recommended pushing it right through so it came out the other side (Theodorich Borgognoni 1955 vol.1, p.85), taking care to cause as little damage as possible to the uninjured tissues. If barbs prevented its immediate removal an alternative approach was to wait a few days for the tissues around the arrow to putrefy and soften, so enabling the arrow to be pulled out at that time. Another potential problem was that it could be very difficult to remove the injured man's armour as the weapon would have effectively nailed it to his body. Sometimes ingenious contraptions were used to remove projectiles such as the crossbow bolt or arrow (Salazar 1998; Theodorich Borgognoni 1, p.85-7), including sliding tubes (Paterson 1988) or even a crossbow itself in a case from thirteenth century Spain (Burns 1972). In view of the similarities between the injuries resulting from these two weapons they are dealt with together here.

On the First Crusade the knight Walter the Penniless was killed in battle near Nicaea in Asia Minor, fighting against against Kilij-Arslan the sultan of Rum. Apparently seven

arrows penetrated the metal rings of his hauberk to enter his chest before he died (Albert of Aachen bk1 ch21). Many similar examples of arrows piercing the mesh of the hauberk can be found in crusader texts (Albert of Aachen bk3 ch33; John of Joinville 1955 p.84). In the siege of Nicaea itself Baldwin of Ghent died from an arrow through his skull (Albert of Aachen bk2 ch29). Presumably a knight of such standing would have been well armed and had a helmet, which would have had to have been pierced by the arrow. Examples such as these go to show how effective a weapon the arrow was as that time. In the siege of Arsuf in 1101 a Christian hostage named Gerard of Avenses was tied to a makeshift cross and set up on the town walls. However, the Frankish army continued to attack with the result that he was inadvertently hit by a number of arrows from the Christians (Albert of Aachen says ten). It was presumed that he had died and he was given up for dead when the siege was unsuccessful and the army left. However, when peace was later made between the Christians and those of Arsuf, Gerard was returned to Jerusalem, 'cured of all his wounds' (Albert of Aachen bk7 ch2 and 15). It is possible that the arrow wounds were not severe and he managed to survive them despite languishing in a dungeon. However, if he really was hit by ten arrows wearing no armour, it would be surprising if he survived. It may be that his wounds were treated by a surgeon in the town so that he could be used for future bargaining or ransom. The problem of multiple arrow wounds is mentioned in many chronicles and seemed to have been an occupational hazard in large battles. King Richard the Lionheart took part in the fighting around Jaffa in August 1192 while on the Third Crusade. Ambrose (Ambrose 1939 p.151) tells us how, 'his body, his horse, his trappings all were so covered in arrows which the swarthy folk had rivalled at shooting at him that he resembled a hedgehog.' Not surprisingly he was not in the best of health after the battle and, 'King Richard fell ill from the exhaustion of the battle and the stink of the corpses.' He decided that, 'he would return to Acre to take medicines and get well' (Richard de Templo 1997 p.370). Lord John of Joinville was injured in the Battle of

Mansourah in Egypt in 1250 (John of Joinville 1955 p.84) when he was, 'covered with the arrows that missed the men-at-arms. Fortunately I found a Saracen's padded jerkin stuffed with wadding. I turned the open side towards me and made a shield of the jerkin. It served me well for I was wounded by the arrows in only five places, while my horse was in fifteen.' Later that evening (John of Joinville 1955 p.88) we hear, 'when I was in bed, where I badly needed to rest the wounds I received during the day, I got no such repose. Before it was properly light there was a shout in our camp, "to arms, to arms!" ..... I sent to the king for help as neither I nor my knights were able to put on hauberks because of our wounds.' It sounds as if the five arrows had been removed as only the wounds are mentioned at that point.

The use of poison on the tips of arrows is demonstrated in this interesting case. Emperor John II of Byzantium was hunting in the Meadow of Mantles near Anavarza, Cilicia in April 1143. William of Tyre (William of Tyre 1943 vol.2.p.127) recorded events with, 'suddenly a wild boar which had been started up by the dogs, infuriated by their shrill insistent barking, rushed past the hiding place of the Emperor. With marvellous swiftness he seized an arrow but he carelessly stretched the bow too far and wounded himself in the hand with the point of the poisoned arrow. Thus, from so trivial a cause, he received the summons of death. The pain of the wound soon compelled him to leave the woods and return to camp. Physicians were summoned in numbers. He explained the accident to them and did not hesitate to say that he had caused his own death. Full of solicitude for their lord's safety, they applied remedies but the fatal poison had already permeated his system. The means taken did not avail and the venom continued to creep still further to the internal parts, thus effectively preventing all hope of recovery. He was advised that there was only one course of action which might save his life; the injured hand, in which yet all the potent evil was concentrated, might be removed before the poison infected the rest of his body. But the

emperor, a man of lofty spirit, although suffering intense agony and convinced that death was imminent, still steadfastly preserved his imperial majesty and rejected the advice.' The use of arrow poison to increase the effectiveness of the weapon has employed for thousands of years (Bisset 1989). Written texts from ancient Greece, the Middle East, India and China all mention them. By the medieval period arrow poison was mainly restricted to hunting animals although there were laws regarding its use in attempted murder. It is thought that the main plant extracts used as arrow poisons in Europe and the Middle East at that time were from the white hellebore *(Veratrum album)*, aconitum *(Ranunculaceae sp.)* and possibly henbane *(Hyoscamus niger)*. Other substances applied to arrows before use included human saliva and possibly extracts from snakes. While several Byzantine chronicles also blame poison on the arrow head, an alternative hypothesis has been proposed for John's death. It is possible that the wound became infected either by bacteria from dirty arrow head or organisms normally present on the skin (Lascaratos 1998). This is because some accounts of the story suggest that he lived over a week, while most poisons should have killed much faster. Evidence for the use of aconitum as a poison in the Byzantine Period can also be found in the case of Emperor John I Tzimisces (ruled 969-976AD) who appears to have been poisoned by a disgruntled eunuch (Lascaratos 1998).

Sometimes death following an arrow wound was because of infection leading to gangrene, rather than poison. A twelfth century case was that of Shihab-al-Din, a Muslim from Shaizar who was hit by a Frankish arrow in an engagement at the ruined castle of Afamiyah (Usama ibn Munqidh 1929 p.75-6). The arrow hit him in the lower arm and after the skirmish it was removed and bandages applied. However, after three days his arm turned black and he became unconscious, then died. Whether or not we can trust Usama's stories, this description is classical for gangrene This is a process where bacteria contaminate the wound, spread rapidly through the tissues and can kill in a few days. It is thought that a

significant proportion of battle wounds might have developed gangrene in the medieval period. Another potential complication from a penetrating arrow wound is osteomyelitis. In this case infection is in the bone, rather than the soft tissues as was the case with gangrene. A legendary example is that of Robert, Duke of Normandy who was said to have been wounded in the arm by an arrow on the First Crusade. Even though it was removed a sinus developed and the legend states that he went to the doctors at Salerno for treatment (Magistri Salernitani 1923 p.13). As with most legends there is often an element of truth to the story. Penetrating wounds may lead to chronic infection in bone if bacteria are introduced into the bone marrow at the time of the injury. This osteomyelitis will lead to chronic discharge of pus via a sinus to the skin and such a problem was described in the legend. Even if this particular example may have been just a story, it is likely to reflect the diseases common at the time.

Detail on the impressive penetrating power of the lance can be found in a number of chronicles. On 14th August 1119 Usamah fought his first battle with the Franks and attacked a certain knight (Usama ibn Munqidh 1929 p.68-9). 'All of a sudden I saw him spur his horse and as the horse began to wave its tail I knew it was already exhausted. So I rushed on the horseman and struck him with my lance, which pierced him through and projected about a cubit (50 cm) in front of him..... A few days later a messenger came to summon me before my uncle at a time in which it was not his custom to call me. So I hurried to him and saw that a Frank was in there. My uncle said to me, "Here is a knight who had come from Afamiyah to see the horseman who struck Philip the knight, for the Franks have all been astounded on account of that blow which pierced two layers of links in the knight's mail hauberk and yet did not kill him." "How", I said, "could he have survived?" The Frankish knight replied, "The thrust fell upon the skin of his waist." It seems that Philip the knight must have been rather overweight so that the lance went through the fat on his waist but did not enter the abdominal cavity. Another vivid demonstration of the penetrating power of the lance comes from the

Seventh Crusade to Egypt. John of Joinville tells us of a wound at the Battle of Mansourah (John of Joinville 1955 p.80) to, 'Lord Frederick of Loupey by a lance between the shoulders; the wound was so large that the blood poured out of his body as though from the bung of a cask.' It sounds as though the thoracic aorta was severed by the injury. Clearly with a hole in the largest artery of the body he would not have lived long enough to receive the attention of a surgeon.

The vulnerable areas of a horseman when attacked by an infantryman with a spear are highlighted in this description by Usamah (Usama ibn Munqidh 1929 p.71-2). In a raid on Shaizar by Franks from Antioch around 1122, a brigand named Zammarrakal infiltrated the Frankish camp to steal what he could. After taking a horse, shield and lance he was confronted by a footman. 'As I was making my way out from among their troops a footman pursued me and thrust his lance through my thigh.' He apparently told this story to Usamah while sitting on a rock with dried blood covering his leg and foot. The thighs of a man on horseback were closest to the footman, which made an injury there relatively easy, while it was hard to protect the legs with a shield which mainly covered the trunk.

The problems facing the doctor attempting to treat a lance injury are shown in the next two passages, which both refer to the same individual and may be referring to the same incident. In 1103 King Baldwin I was hunting animals near Caesarea but was ambushed by some Saracen soldiers. While the king's party had swords and hunting bows with them, they were not expecting trouble and were not wearing any body armour nor carrying shields. Albert of Aachen (Albert of Aachen bk9 ch21-2) tells us how the king, 'was pierced through the thigh and kidneys by the furtive lance of a Saracen hanger-on who was lurking among the branches and thick leaves. At once streams of blood gushed ominously from so cruel a wound of so powerful a king, his face began to grow pale, his spirit and strength to falter, his hand to cease from fighting with his sword, until at length he fell from his horse to the ground as if

dead and destroyed, and he was believed to have expired..... they placed him on a stretcher and took him back to Jerusalem amidst a very great weeping and lamentation of men and women, acquiring very experienced doctors for him, by whose skill and experience their king and strong champion could recover his health after this lethal wound.' The fact that the lance pierced his thigh and abdomen in the region of the kidneys suggests that weapon was used at an angle, either pointing upwards or downwards. If the attack was from a footman then it would be expected that the lance would have been aimed upwards, passing through the thigh and then entering the abdomen. If the attack was from another horseman or from someone hiding in the branches of one of the trees then the lance could have been aimed downwards, so that it passed through the abdomen first and then entered the thigh. In any case, the symptoms which followed suggested that Baldwin lost a significant amount of blood from the injury. He went pale and fell from his horse, which would be expected in significant blood loss as the brain fails to get enough blood which leads to dizziness and fainting. The fact that the king lost consciousness is supported by the fact that his companions thought he had died. It would normally take blood loss of about two litres before a fit adult male would lose consciousness from hypovolaemic shock (Committee on Trauma, 1994). To lose this much blood so rapidly Baldwin must have suffered a laceration to an artery, large vein or vascular organ such as the liver or spleen. Albert says the injury was at the site of the kidney but does not specify which side. The liver lies adjacent to the right kidney while the spleen is adjacent to the left kidney and either organ could easily have been damaged. Interestingly Baldwin survived the trip to Jerusalem so his body must have formed a blood clot at the site of the laceration to the blood vessel, preventing the loss of a fatal amount of blood. Doctors of a standard to work for a king should have known the basics of anatomy. Although they did not know how the organs worked they would have known that the heart and lungs lay in the chest (French 1978) and that the kidneys were a few centimetres below the lungs, on the back

of the abdominal wall below the diaphragm (Derenne 1994). The anatomy of the kidneys was described in some detail in the works of Galen (Scarborough 1976b) and al-Majusi (Eknoyan 1994), even noting subtle details such as the location of the right kidney being slightly higher than the left. It is unfortunate that the account does not specify if these 'experienced doctors' were Europeans who stayed on after the First Crusade or indigenous practitioners.

The incident described by Albert of Aachen may well have been the same injury recounted in the chronicle of Guibert of Nogent (Guibert of Nogent 1997 p.134). It highlights the difficulties in treating penetrating wounds as the size of the skin would usually be far too small to determine exactly which organs have been injured. 'He suffered a similarly severe wound in battle, in the course of saving one of his foot soldiers who had supported him bravely. Foresight led the doctor whom he summoned to resist covering the wound with medicinal poultices because he knew that the wound was very deep and while the skin could be made smooth the wound would fester deep within his body. He proposed to conduct a remarkable experiment. He asked the king to order one of the Saracens whom they held prisoner to be wounded in the same place and in the same manner as Baldwin himself had been (for it was forbidden from him to ask for a Christian) and to have him killed thereafter so that he might look more freely into the corpse and determine from the inspection something about the king's own internal wounds. The prince's piety recoiled in horror at this suggestion and he recalled the example of ancient Constantine, declaring that he would not be the cause of death of any man, however insignificant, for such insignificant salvation, when it is ever doubtful. The doctor then said to him, 'if you have decided that no man's life can be spent on your own well being then at least give the order to bring forward a bear, an animal useless except for show, and have it hung up by its front paws, then struck with an iron blade so that I may examine its entrails and I shall be able to measure how far it went in and therefore determine the depth of your own wound.' The king answered him, 'the beast will be brought

immediately since it is necessary: consider it a done deed.' Then when the doctor had finished his experiment at the animal's expense he found as we mentioned above, that harm could come to the king if the wound were quickly covered unless the pus was removed and the interior part of the wound would heal.' It is interesting that Guibert, a Benedictine Abbott writing in 1106-9, appears knowledgeable about the problem of pus in wounds. It is not clear whether this was from reading medical texts or perhaps experience in the monastic infirmary. Pus is suggestive of infection and from a modern viewpoint a penetrating wound to the abdomen with a deep collection of pus is likely to lead to chronic fevers, sepsis and potentially death from peritonitis. Guibert and his era clearly did not understand the concept of infection as we do but still did regularly see pus in wounds and interpreted this in a way compatible with their own view of disease. Pus was typically thought of as formed from humours altered by putrefaction in the wound (Theodorich Borgognoni 1955 p.31). Medieval medical texts varied in their opinion as to whether the formation of pus in the first place was a good ('laudable') or bad thing (Cope 1958). However, everyone agreed that once formed it was better out than in and many believed that good pus might clean the wound as it flowed out. The other interesting component of this account is the use of anatomical dissection by European practitioners at such an early date. The initial request is to perform human dissection on a captured non-Christian and this was at a time that such a practice does not appear to have been performed in Europe, even on the excommunicated or criminals (Persaud 1984 p.77-88). The king declined and the alternative was to dissect a bear, one of the animals used by Galen in his own dissections (Savage-Smith 1971a). It is possible that this animal was chosen as it could stand on two legs and therefore perhaps provide a more accurate model for a human wound than dissection of a pig, which was the standard animal in the European anatomical dissection texts of the time (Corner 1927; O'Neill 1970). Since the European evidence for dissection at this early date appears to originate in Italy, especially around

Salerno, one possibility is that the medical practitioner looking after the king had trained at Salerno. However, if it is argued that the choice of a bear would be too novel for a European then another alternative is that the practitioner was a Byzantine Christian accompanying the king. This should be considered since Galen's texts describing the dissection of bears along with other animals would have been available in the Byzantine world, while they are not thought to have been known in Europe at that time.

Head Injuries

The head was a popular part of the body for an attacker to focus his blows. Examples of fatal and nonfatal blows to the head have been recovered from the Frankish castle of Jacob's Ford. Since the effects and treatment of cranial injuries were similar regardless of the type of weapon used, they are worth discussing as a separate group. Textual evidence for injuries to the head includes those sustained in personal combat from blows with the sword or mace and also from projectiles such as the arrow or rock from a siege engine (Hill 1998). The use of a helmet certainly gave some protection but did not completely prevent serious head injury. Penetrating head injuries in the Crimean War and American Civil War were associated with a mortality rate of over 70% (Rose 1997). This helps to explain the advice to surgeons found in medieval medical texts recommending caution before agreeing to take on the care of a patient with a head wound.

It is clear that from the start of the crusades those without medical training were aware that some head wounds were treatable while others were incurable. Albert of Aachen (Albert of Aachen bk4 ch35) wrote of the injury sustained by a knight named Franco, from the town of Maasmechelen in Belgium, once the crusaders had taken the city of Antioch but not the citadel. Soldiers from the besieging Muslim army of Kerbogha injured Franco on the head

during an attack on a tower. It was described as a, "very severe and scarcely curable wound," which does suggest awareness that some head wounds are curable while others are fatal whatever is done. This fact is borne out in contemporary medical texts from both Europe and the Middle East (Rose 1997).

A large number of cases are described in the sources where head wounds resulted in death. There are examples where rocks from a siege engine caused fracture of the skull and understandably the outcome was usually fatal. In the siege of 'Arqah in the First Crusade, Anselm of Ribemont was killed when a rock from the citadel hit his skull (Albert of Aachen bk5 ch31). Sword blows were also frequent directed at the head and a firm strike with a sharp sword could even cut right through a well made helmet. The infamous Battle of the Field of Blood took place between Antioch and Aleppo in 1119 and the end of battle was brought about by the death of Roger of Salerno, the prince of Antioch, through a blow to the head. Walter the Chancellor was an eyewitness present at the battle and mentions the way Roger was killed (Walter the Chancellor 1999 p.127). Apparently, 'He was struck by a knight's sword through the middle of his nose right into his brain.' Clearly such serious damage to the brain would have caused death instantly.

King Fulk of Jerusalem had an unfortunate hunting trip in November 1143 near Acre. William of Tyre (William of Tyre 1943 vol.2. p.134) tells us, 'as they were riding along, the servants who had preceded the train happened to rouse a hare which was lying in a furrow. It fled, followed by the shouts of all. The king, impelled by evil fate, seized his lance and joined the pursuit. In vigorous chase, he began to urge on his horse in that direction. Finally, the steed driven to reckless speed, stumbled and fell. The king was thrown head foremost to the ground. As he lay there stunned by the pain of the fall, the saddle struck his head and his brains gushed forth from both ears and nostrils. The members of his escort, those in advance and those following him, overcome with horror at the frightful accident, rushed to his aid as he

lay on the ground. They found him unconscious, however, unable to speak or understand ..... Tearfully the bore him back to the city, where he lived until the third day, unconscious but still breathing.' The description of material discharging from the nose and ears suggests that the base of the skull was fractured, as it allows cerebrospinal fluid and blood to leak out at these sites. Contemporary medical texts showed awareness that it often took about three days for someone to die after an open skull fracture, if not killed instantly. From a modern perspective it appears that they were referring to the effects of infection. Theodorich wrote one hundred years after this incident, 'most particularly of all, one must be careful that everyone having a wound on the head (especially if there is suspicion of internal injury) keep it from every pollution, because if care is not exercised in head wounds spasm will occur very quickly and when this has happened, according to most evidence, he will die a most bitter death on the third day' (Theodorich Borgognoni 1955 p.95).

John of Joinville described a case (John of Joinville 1955 p.67) in June 1249 at Damietta in Egypt. 'It was that day that my Lord Walter of Autreche armed himself at all points in his tent and, mounting his horse, with his shield round his neck and his helmet on his head, ordered the flaps of his tent to be lifted and he spurred his horse towards the Turks. As he rode alone out of his tent, all his people raised a loud cry of, "Chatillon!" But it happened that before he reached the Turks he fell and the horse galloped over his body. The horse, whose housing bore his arms, went over to the enemy; for the greater part of the Saracens were mounted on mares which attracted it to their ranks. Those who saw what happened told us that four Turks attacked Lord Walter as he lay on the ground and as they passed by him they gave him great blows with their maces. The Constable of France, with some of the king's men-at-arms, rescued him and they carried him back to his tent in their arms. When he was brought in he was speechless; some of the doctors and surgeons in the camp came to him and as he did not seem to be in danger of death they bled him in both arms.

Very late that evening my Lord Aubert of Narcy told me that we ought to go and see him because we had not yet done so and he was a very brave man and had a fine name. As we went into his tent, his chamberlain met us and asked us to walk gently so as not to wake his master. We found him lying on some rugs of ermine; we went quietly up to him and saw that he was dead.' Whilst Lord Walter clearly received a number of injuries both from his horse and also the mace blows, the fact that he was speechless but still conscious suggests that he sustained a significant head injury. Whether his death later that day was from internal bleeding in his abdomen or chest, or whether it was due to cerebral contusions and intracranial haemorrhage it is not possible to tell.

While many of the serious head wounds described were fatal, there are occasional examples when the wound was survived but left a residual neurological deficit. The Muslim warlord Il-Ghazi of Aleppo received a head wound in battle against the combined Christian forces of King David II of Georgia and some Frankish troops in 1121. It took a long time for him to recover and a year later, in 1122, he was still not back to health and was known to be 'afflicted by a kind of paralytic illness' (Walter the Chancellor 1999 p.171). A possible explanation is that the head injury he sustained in the battle with King David caused damage to the brain which was unable to heal. While the functions of the brain are very complex and clearly baffled doctors in the past, they did have some appreciation that different areas performed different functions and that injuries to one side of the head may lead to weakness on the other side of the body (Lokhorst 1982). The parts of the brain which control movement in the body (the precentral gyri) are located on its surface, just beneath the skull, on the left and right sides of the head (Fitzgerald 1985 p.140). Archaeological research has shown the area of the left precentral gyrus, which controls motor function to the right side of the body, to be the most common site for weapon injuries to the head in the medieval period (Inglemark 1939-40). In consequence it is not unreasonable to suggest that his head injury

could have been responsible for the paralysis noted on the chronicles.

While details on the actual treatment given for a head injury is not given in these sources, an indication on how a doctor of the time might have treated al-Ghazi or a Frank who survived the initial injury may be found in the medical texts, where there is broad agreement on management (Theodorich Borgognoni 1955 p106-124; Hunt, 1992, p.3-15; Albucasis 1973 p.698-710; Paulus Aegineta 1846 vol.2,p.430-2). It is difficult to determine quite how interventional the surgeons would have been when considering which treatment options to employ, but archaeological evidence for all the approaches described in the medical texts has been found in excavated remains from medieval Europe. The first decision was whether to take on the care of the patient in the first place. Signs of a poor prognosis included loss of consciousness, seizures, vomiting, fever, discharging pus and inability to speak (note the information on Lord Walter of Autreche). If none of these were present an assessment was required to see if a fracture had been sustained, or if the injury had just resulted in bruising to the scalp and perhaps concussion. The simplest techniques described involved cleaning the wound and then determining if a fracture of the skull had occurred. Non-invasive tests for a skull vault fracture included palpation of the scalp for any indentations or protruding bone and plucking a taut string with one end held in the teeth as the pitch was thought to be effected by a skull fracture. To detect a base of skull fracture, one option if the patient was conscious was to perform a Valsalva manoeuvre. In this test attempting to exhale against a closed nose and mouth increases pressure in the airways and might force air out of any fractures of the skull vault if free air had escaped from the pharynx through the skull base fracture. While this would never be attempted now, it does sound a very practical test and might theoretically have worked. A more invasive method was to feel for any fractures with a probe or to cut the scalp with a knife to allow good access and then pour ink into the wound, which would highlight any fractures as dark lines. Once a fracture was discovered it was the

doctors duty to explore it and remove any sharp bone fragments that might be protruding into the brain and so causing serious damage. This is specifically mentioned in the thirteenth century laws of the kingdom of Jerusalem, as described in the *Livres des Assises de la Cour des Bourgeois*. The law states that, 'If my servant has a head wound with the bone broken and he doesn't know how to remove the pieces, so that the broken bone pierces the brain so that he dies, reason adjudges that he is legally bound to pay for the servant.' If the injured individual was a free man then the punishment was for the surgeon to be hung (Assises de Jerusalem 1843 p.164-6). Similarly the surgeon was obliged to visit the patient daily, as failure to do so was regarded as negligence if the patient subsequently died. The fact that this specific law was included among the limited examples of medical negligence in that bill suggests that previous cases may have come to court in the Frankish states, and is strongly suggestive that this technique recommended in medical texts was in fact employed there. The scalp was shaved and a cross shaped incision made in the scalp to ensure a clear view of the injury. Depressed or fragmented areas of bone were freed with mallet and chisels and removed with fingers or forceps. Some texts describe the use of 'non-sinking drills' which had a collar that prevented the drill plunging into the brain once it had penetrated the skull vault (Albucasis 1973 p.698-710). These drills might have been useful in the removal of problematic bone fragments. Rough bone edges were then smoothed off with a rasp, the scalp replaced and the wound dressed with bandages soaked in oil of roses or wine. A comparable example of such cranial surgery is the case of Juan del Frago who in 1330 had eighteen pieces of broken bone removed by a surgeon in Aragon after an assault and survived to accuse his attacker (McVaugh 1993 p.160). Another case of cranial surgery from early thirteenth century France was recorded by a medical student watching the operation at the hospital of the Holy Spirit in Montpellier (Demaitre 1975). It does appear that similar operations for skull fractures were taking place in the Latin East too.

Crush Injuries

A crush injury is one in which a blunt force is applied to a part of the body resulting in the crushing of the tissues. This contrasts with sharp injuries from a sword or arrow in a number of ways. The area of tissue damage may be much larger in a crush injury so that it can take a long time to heal. If large areas of muscle are damaged this can lead to renal failure when chemicals from the muscle are released into the blood and damage the kidneys, termed rhabdomyolysis. If the damage is severe enough the individual can die. Moreover, it is often difficult to tell early on how much damage has been done, as the tissue appear intact on initial inspection. It is only with time that the damaged tissues swell and become bruised or the patient becomes seriously ill from internal bleeding if an abdominal organ is ruptured, so that the true degree of damage becomes clear. If a limb is crushed a very serious complication which may follow is compartment syndrome. When the damaged tissues in the arm or leg swell with fluid the local pressure in those tissues rises. This may compress the veins which drain blood out of the limb, since they have a thin, flexible wall. Arteries, however, have a thick, muscular wall containing blood entering the limb at relatively high pressure and these vessels are not compressed by the swollen damaged tissues. The result is that blood continues to enter the limb while it has increasing difficulty leaving it, so that even more fluid is forced into the tissues and even more veins are compressed. When blood flow is impaired sufficiently by this process for several hours the cells start to die from lack of oxygen and nutrients. Without modern surgical treatment for compartment syndrome, the limb distal to the original crush injury is severely and permanently damaged. At best the nerve damage leads to paralysis and deformity, while the more severe cases undergo sufficient muscle necrosis that the chemicals released into the rest of the body may lead to death in the next few days from multiorgan failure.

There are many examples of crush injuries sustained by crusaders either when actually

travelling to the eastern Mediterranean, in battle or on account of natural disasters which intermittently occurred in the Latin East. The overland journey to Jerusalem was notoriously difficult and perhaps the most dangerous section were the mountainous passes in Asia Minor. Near Laodicea the route of the Second Crusade in 1148 became extremely hazardous. Odo of Deuil (Odo of Deuil 1948 p.117) recounts rather poetically how, 'the mountain was steep and rocky and we had to climb along a ridge so lofty that it's summit seemed to touch heaven and the stream in the hollow valley below to descend into hell. Here the throng became congested while ascending, pushed forward then crowded closely together, stopped and, taking no thought for the cavalry, clung there instead of going ahead. Sumpter horses slipped from the steep cliffs hurling those whom they struck into the depths of the chasm. Dislodged rocks also caused destruction. Thus when the men had scattered far and wide in order to seek out paths, all feared that they would misstep or that others, in falling, would strike them violently.' Sieges were understandably dangerous places to be and there are many accounts of crush injuries during siege warfare. Albert of Aachen noted that at the siege of Nicaea in 1097 on the First Crusade the knight Baldwin Calderun died when his neck was broken by a rock thrown from the walls (Albert of Aachen bk2 ch29). Raymond of Aguilers (Raymond d'Aguilers 1968 p.78) recorded how in November 1098, 'the besieged of Ma'arrat-an-Nu'man hurled stones from catapults, darts, fire, hives of bees and lime on our men who had sapped their walls.' On the Fourth Crusade to Constantinople there was a skirmish outside the city walls in 1203. Geoffrey de Villehardouin (Geoffrey de Villehardouin 1963 p.69) recalls, 'in their pursuit of the Greeks they followed so close to the gate that men on the walls threw great heavy stones down on top of them ..... During this fight Guillaume de Champlitte's arm was broken by a stone.'

Once the armies had reached the flatter land by the coast the terrain posed less of a threat than the rowdy mob of crusaders. There are a number of versions in the chronicles

explaining how Peter Bartholomew died in 1099. He claimed he had found the Holy Lance, which pierced Jesus' side after his crucifixion, in the floor of the church of St. Peter in Antioch shortly after the crusaders had taken the city. Some believed his story while other thought he had made it all up. He agreed to undergo trial by ordeal which took place on 8 April 1099 at 'Arqah, when had to walk between two rows of burning wood which apparently gave out such searing heat that no one could get close to it once it was lit. Those who did not believe Peter took his death after the ordeal as proof that he had been lying. Those who supported him said his survival of the ordeal in the short term proved his innocence and explained his later death as accidental crushing from the crowd. Certainly death from the crush in medieval crowds affected by religious fervour, especially in the proximity of relics, is well known (Dickson 2000). Raymond of Aguilers (Raymond d'Aguilers 1968 p.102) who believed Peter, wrote, 'As he emerged, Peter waved to crowd, raised the lance and screamed out, "God help us." Whereupon the crowd seized him, seized him I say, and pulled him along the ground. Almost everyone from the mob pushed and shoved thinking Peter was nearby and hoping to touch him or snatch a piece of his clothing. The mob made three or four gashes on his legs in the tussle and cracked his backbone..... After Peter's wounds were bound up, he rested.' He lasted until 20 April (Raymond d'Aguilers 1968 p.108) when, 'Peter Bartholomew, debilitated by illness resulting from his crushing blows and wounds ..... on the hour set by God, died peacefully.' Clearly he received some kind of medical care for his injuries, be they burns, lacerations or fractures, but there is no detail of who dressed his wounds. Trial by ordeal was a common technique right across Europe from 800-1200AD (Bartlett 1986). It was used in cases from simple theft and sexual offences to murder and heresy. Ordeal was usually employed when no other mode of proof was available, such as witnesses. There were many variations in the type of ordeal used. Some involved holding the skin next to something that would normally burn it, as happened with Peter Bartholomew,

and the individual was vindicated if no burn occurred. Usually candles, boiling water, hot iron, plough shares or axe were used. Other versions of ordeal included trial by water, by the cross (where two contenders stood with their arms out like a cross and the first one to tire was deemed the wrongdoer) or by combat. Trial by combat was described in the Frankish laws of the Principality of Antioch as the method to determine guilt in cases of murder (Alishan 1876 p.62). Usama described a case of trial by ordeal between two Franks in Nablus. One man was accused of acting as guide to an Islamic raid on a nearby Christian village and was made to fight the local blacksmith, both armed with a club and a shield. The blacksmith, used to wielding a hammer all day, beat the suspect to death and the body was then hung (Usama ibn Munqidh 1929 p.167-8). A further example of trial by water was described, when a *poulain* (son of a Frankish father and local mother) was suspected of murdering Franks when he had the chance as he had become a Muslim. He was lowered on a rope into a barrel of water and since he floated he was convicted of his crime and blinded (Usama ibn Munqidh 1929 p.168-9). Blinding was sometimes preferred by the Franks to capital punishment as it gave opportunity for later repentance and spiritual salvation (Bruce 1941). The details of both of these stories suggest that they were included by Usama for their amusement value from the perspective of a Muslim audience laughing at their Frankish neighbours. However, they do confirm the use of trial by ordeal by the Franks and in the context of the legal evidence for such trials the accounts may have some truth to them.

There are some examples that describe how large numbers of people were killed when the mass of a crowd tried to enter a confined space. Typically it was those near the front who died as a result of pushing from the back of the crowd. When the crusaders stormed Jerusalem in July 1099 the army was so keen to enter the city through the few narrow open gates and sections of breached wall that some were crushed under the stampede (Albert of Aachen bk6 ch21). Once in the city many locals tried to hide from the crusaders in the royal cistern, a

large water storage facility filled from rain falling on nearby roofs. There were many openings in the vaulted roof which could be used as wells from above, but it was possible to fall down these. 'As many Christians as Saracens fell headlong in the flight and blind rush and were not only in danger of drowning but also died of broken necks and limbs or ruptured entrails' (Albert of Aachen bk6 ch22). When Godfrey of Bouillon defeated the Egyptian army near Ascalon in Autumn 1099 many of the vanquished ran towards the city. There was not room for the thousands of people to get through the gates in such a hurry and many died in the crush (Albert of Aachen bk6 ch49). In 1107 panic spread through Frankish forces near Jaffa who were planning to engage a larger force of Muslim troops from Ascalon. As they fled back to the city those on horseback apparently rode over and trampled many of the foot soldiers in their race to get to the gates before the pursuing Ascalonites cut them down (Albert of Aachen bk10 ch13).

Sometimes it was an accident due to faulty crusader engineering that led to crush injuries. The method of undermining the walls of a besieged castle is described well by Albert of Aachen regarding the siege of Nicaea in 1097. After constructing a protective covering they began, 'hollowing out the earth under the foundations of the tower with mattocks and sharpest iron, until he could construct beams, posts and other enormous oak timbers in that same excavation under the foundation, on which the walls would be supported after the earth had been taken away so that they would not suddenly fall down on top of those still digging. Now once a great excavation had been made, both wide and long, on the instruction of the master-craftsman, everyone in the army, small and great, gathered twigs, stalks and sticks and dry reeds, pieces of tow and all sorts of kindling and heaped it between the posts and beams and the splendid timbers, everywhere where the excavation was occupied by these pieces of wood. After this, fire was put in by the master of the siege work, it was encouraged by a great breath until, roaring and racing in different directions, the unconquerable flame grew stronger

and stronger and it reduced the posts, the beams and all the wood that had been put underneath to ashes. When these things had been reduced to embers and there was no prop for the foundations either of earth or of wood, the building of that very ancient tower fell flat in a moment in the middle of the night and it made such a noise that it was taken for a crash of thunder by all the people who were awoken from their sleep' (Albert of Aachen, bk2 ch36). The anonymous Syriac chronicle described the fate of Joscelyn of Edessa in 1131, when this technique did not go to plan. Joscelyn, 'who was advancing in years but did not rest from fighting, gathered an army to destroy a castle named Tell 'Arran, between Aleppo and Mabbiy where dwelt robbers who wasted the country continually. He dug tunnels under it to make breaches in it, went down to see them for himself and a breach fell on him and buried him. When they dug him out he was at his last gasp so they carried him back to Tell Bashir, for his body was crushed and he was very ill.' William of Tyre. (William of Tyre 1943 vol. 2. p.51) adds, 'His people rescued him with much difficulty and he was found to be suffering from many fractures. For a long time he had been ill from his injuries.' Presumably his doctors would have been treating the fractures during his protracted recovery.

Battle was not the only time crush injuries occurred and a terrifying cause of such injuries was the earthquake. The Frankish states lay on the Dead Sea Transform Fault System which is a continuation of the Great African Rift (Girler 1990). Movement of the western Sinai Tectonic Plate relative to the eastern Arabian Plate results in earthquakes in the eastern Mediterranean to this day. There is evidence for thirteen or fourteen earthquakes during the 200 year existence of the Frankish states and several more were felt in Frankish lands but did no damage there as the epicentre was elsewhere (Amiran 1994; Poirier 1980). As an eyewitness Walter the Chancellor recorded in his chronicle (Walter the Chancellor 1999 p.80-1), 'In the 1115th year from the incarnation of Our Lord Jesus Christ, on the eve of the feast of St. Andrew the Apostle and in the silence of the dead of night, when human frailty was

accustomed more suitably and more sweetly to sleep, there was an immense and terrible earthquake in Antioch and its region. And as a matter of fact, in that same unexpected earthquake men were horrible knocked around and they felt, saw and heard the collapse of walls, towers and different buildings deeply threatening to themselves and others; some thought to escape by running away, some to slide down the walls, certain men gave themselves up and threw themselves down from high houses. More, indeed, were caught piecemeal in their sleep by the collapse, in such a way that even if a part of the wall remained intact they were nowhere to be seen. Others indeed were terrified; they abandoned their homes, scorned their wealth, left everything and behaved as if demented in the streets and squares of the town. They stretched out their hands towards the heavens because of their manifold fear and powerlessness and cried tearfully without ceasing in different languages, "Spare us, Lord, spare your people." Another earthquake occurred in the year 1170 (William of Tyre 1943 vol.2. p.370). 'In June of the following summer, that is in the seventh year of King Amaury, a great and terrible earthquake, more violent than any other within the memory of men now living, occurred in the orient. Strongly fortified cities dating from very early times were completely demolished. The inhabitants, caught in the ruins of their homes, were crushed to death and only a few survived. Not a spot in the entire country was left untouched by loss of property and domestic tragedy.'

Other crush injuries were sustained during recreational activities. In 1159 Emperor Manuel I of Byzantium visited King Baldwin III of Jerusalem at Antioch after giving his niece Theodora to marry Baldwin. William of Tyre (William of Tyre 1943 vol.2. p.280) tells us, 'they were riding through the forest, as hunters do in the pursuit of that sport, when on the solemn day of the Ascension of our Lord, an accident befell them. The king, borne along on his fleet horse, was riding over rough ground covered with low-growing shrubs and brambles, when he was flung headlong to the ground from his horse and suffered a fractured arm. As

soon as the emperor learned of the accident, he took upon himself, with the most gracious sympathy, the office of surgeon; he knelt down by the king and attentively administered to him, as if he himself were merely an ordinary person. Meanwhile, his nobles and kinsmen were dumb with wonder and dismay. That the emperor, regardless of his imperial majesty, should lay aside his august dignity and show himself so devoted and friendly to the king appeared to all unseemly. When, on account of this accident, they returned to Antioch, he visited the king daily, himself renewing the poultices and healing ointments and then carefully replacing the bandages.' A number of other occasions are known when Emperor Manuel personally treated patients, in contrast with the emperor's more socially accepted role merely as official protector of the hospitals and other charitable institutions in the Byzantine Empire (Lascaratos 1996).

The treatment of a fractured long bone, such as this, involved firm longitudinal traction followed by manipulation to return the bone fragments back to their original position relative to each other. This position was then held by bandaging the leg and employing a technique that maintained the position for the weeks it might take for the bones to heal. Sometimes plasters were made from flour and egg white while others recommended splints made from parallel wooden sticks. (Paulus Aegineta 1846, vol.2, p. 427-60; Theodorich Borgognoni 1955, vol.1, p.161; Albucasis 1973 p.676-83). The laws of the Frankish states also discussed when a surgeon treating such a fracture could be regarded as negligent (Assises de Jerusalem 1843 p.164-6). The *Livres des Assises de la Cour des Bourgeois* state that, 'If a doctor treated a servant, male or female, for a broken arm or leg and said that he would cure it completely and would be the case if he had acted properly and he made a solemn covenant but then broke it and acted badly, applying useless plasters which left men forever crippled, reason judges that the doctor is liable to take the servant and pay his master what he cost..... If he crippled a Christian man or woman, reason adjudges that he should loose his right

thumb.' Clearly it was expected that a surgeon should have been able to straighten long bone fractures and hold them in reasonable alignment with bandages, plasters or splints until they healed.

Burns

Burns appear to have been a surprisingly common cause of injury among the crusaders and the heat might have come from a number of very different sources. The possibility of trial by fire to determine guilt of a crime has already been discussed (Raymond d'Aguilers 1968 p.102; Bartlett 1986 pp.2, 16, 48). Many of the buildings were highly flammable, the conditions were hot and dry for much of the year and fires were a real problem. Sometimes forest fires were responsible for burns and these could be natural or started deliberately. In 1101 a group of around one thousand soldiers travelling across Asia Minor to the Holy Land were trapped by Turks near Kastamonu. On account of the rugged terrain the Turks were unable to attack the crusaders directly. In consequence they, 'lit a big fire from branches of the bushes and dry plant material and filled the valley all around, and the thousand men were consumed by it' (Albert of Aachen bk8 ch. 12).

As well as the possibility of being caught in a burning building or forest fire, a common weapon used in siege operations in the Middle East at that time was Greek fire. This appears to have been developed by the Byzantines in the seventh century AD and was in widespread use by the time of the First Crusade. It was used by all the major armies and was quickly incorporated into the arsenal of the crusader forces, who found out how to make it from local Christians. Different sources described slightly different constituents in making Greek fire (Bradbury 1994), from naptha, olive oil and lime which were then distilled, to other versions such as tar, resin, sulphur and animal fat which were heated together. Whatever

combination of combustible materials were used, the mixture was typically placed in a pottery container, and hurled at the enemy. The pot then broke on impact which allowed the contents to spill out and burn the soldiers or siege engines which were the target. Some combinations had to be lit just before use while others ignited on impact (Bradbury 1979). The fear of Greek fire was due to the inability to extinguish the flames with water and alternative liquids had to be used. It seems that vinegar was found to be the most successful fire extinguisher and the large amount of wine that accompanied armies in the medieval period should have provided a reasonable source of this.

As early as the siege of Nicaea on the First Crusade in 1097 the defenders used Greek fire against the attacking siege engines. Albert of Aachen wrote that they, 'mixed together grease, oil and pitch with tow and strongly burning torches and poured the mixture from the walls and it burnt up completely the apparatus of the battering ram and the wicker frameworks' (Albert of Aachen bk2 ch33). It is possible that some of the men working the ram would have suffered burns as well. The use of vinegar is highlighted in a number of passages. During the siege of Jerusalem in July 1099 the Saracen defenders covered a tree trunk with, 'tow soaked and anointed with pitch, wax and oil and all kinds of things for kindling fire.' They then lit it and lowered it down on a chain to burn up a crusader siege engine. However, the, 'native fellow-Christians had explained to the Christians how this fire, which could not be put out by using water, could only be extinguished with vinegar. So vinegar which had fortunately been placed in wineskins inside the engine was thrown onto the trunk and poured out in this way the great fire was put out' (Albert of Aachen bk6 ch18). Armed with this information on how to protect themselves, it might be expected that fewer crusaders would have suffered burns during sieges than had they continued to use water, which was ineffective. In the siege of Arsuf in 1099-1100 by Godfrey of Bouillon, Greek fire was used by the defenders to burn a crusader siege tower. Unfortunately the fire took hold

quickly and many soldiers in the tower were unable to escape and were burnt under falling timbers. 'More than fifty warriors, appointed by the duke and other leaders, were now overtaken everywhere by the invading flames and they suffered destruction along with that same machine. Some had broken backs and necks, others legs half cut off, hips or arms, certain had burst intestines from the unbearable weight of timbers; having no strength for freeing themselves, they were reduced to ember and ash along with the timbers' (Albert of Aachen bk7 ch3). In the unsuccessful siege of Tyre by King Baldwin I in spring 1112 Greek fire was again used with great effect by the Muslim defenders. The Franks had erected two tall wooden siege towers which allowed them to fire downwards at the men defending the city walls. Large wooden rings were constructed by the defenders and coated with pitch, sulphur, wax and fat mixed with tow. Once it was lit the ring was thrown from the walls onto the tower in an attempt to burn it down. 'Unbearable flames surrounded it on all sides and burnt it with a great and unquenchable fire, along with a great part of the men, who tried to shake off and put out the fire and were completely unable to escape' (Albert of Aachen bk12 ch6). A good campfire tale was that about Emir Husam al-Din 'Abu' I-Haija' al-Samin. The story went that he sustained nasty burns when he tripped and fell carrying a jar of Greek fire to burn down a Frankish siege tower in the siege of Acre in 1190. The *Itinerarium Peregrinorum et Gesta Regis Ricardi* wrote that, 'the flask in which he was carrying the Greek fire was broken by the fall and the inextinguishable liquid set alight the Turk's genitals' (Richard de Templo 1997 p.109). Clearly an emir would be unlikely to be staggering around with a heavy vessel of dangerous chemicals and the very fact that it was his genitals that were burnt does suggest this example was a fictional one. However, it does highlight the use of Greek fire in battle, as such tales would have needed some plausibility or else no one would have found them amusing.

Passages on burns in the medical texts are generally very similar and recommend an

approach distinct to that used for other wounds (Theodorich Borgognoni 1960 p.135-6; Adams 1846 p.42-5). Texts point out the need to prevent blister formation and so early treatment was directed towards this aim. The burn was to be prevented from drying out and was anointed with cooling medications. It could be placed in a bowl of vinegar or covered with wet compresses of vinegar, oil of roses or a number of herb extracts. Alternatives were ointments made from combinations of egg, rose oil, vinegar, opium and a range of herbs, covered with a dressing. Once blisters had developed then different drugs were used. Three ointments described by Theodorich Borgognoni were frankincense, mastic and elder bark mixed with oil and wax; egg white, camphor, ceruse with oil of roses and wax; thistle root with pork fat and wax.

Surgery for the Complications of Malnutrition

An example where surgery was used on the battlefield on large numbers of soldiers can be found in the crusade of 1248-50 against Egypt. King Louis IX of France led the crusade and took the coastal port of Damietta. By the beginning of 1250 he had advanced to the town of Mansourah in the Nile Delta where between February and April the army became trapped between canals. The army became reliant on supplementing its diet by fishing from the canals hemming it in, which were clogged with the dead of both sides. At this point large numbers of the army became sick and for want of a better explanation they blamed the illness on the fish. Lord Joinville developed the symptoms himself (John of Joinville 1963 p.237-44) and wrote, 'The only fish we had to eat in the camp for the whole of Lent were eels, which, being greedy creatures, feed on the dead. On account of this evil circumstance and because of the unhealthy climate - for not a drop of rain ever falls in Egypt - a disease spread through the army of such a sort that the flesh on our legs dried up and the skin became covered with black spots and

turned a brown earthy colour like an old boot. With those who had the disease the flesh on the gums developed gangrene and no one who fell victim to it could hope to recover, but was sure to die. An infallible sign of death was bleeding from the nose..... I fell victim to the sickness that had stricken the army and it affected my mouth and legs..... The sickness that had stricken the army now began to increase to such an alarming extent and so many people suffered from mortification of the gums that the barber surgeons had to remove the gangrenous flesh before they could either chew their food or swallow it. It was pitiful to hear around the camp the cries of those whose dead flesh was being cut away; it was just like the cry of a woman in labour.' After his capture by Muslim forces, Joinville writes, 'Then one of the saracen knights told our rescuer to bid us take comfort for he would give me something to drink that would cure me within two days. And this, I may say, he did.'

It is interesting that as a secular writer Joinville does not blame the illness on sinful activities in the army, as the priests and bishops often did on crusades, but tried to explain it with logical, natural theories. He thought it might have been the result of eating the eels which had been feeding on decomposing human bodies and it is perfectly reasonable to propose that disease would follow from drinking contaminated water and eating fish from such a polluted source. As it happens we can identify the disease and explain its cause and show that the eels were not to blame. However, this does highlight the sensible attitudes to the cause of disease held by many lay people in the thirteenth century. The most likely explanation for the symptoms described by de Joinville is that he and many others in the army had developed scurvy. This is a condition resulting from the lack of vitamin C (ascorbic acid), normally obtained by the consumption of fresh fruit and vegetables. Symptoms include progressive weakness with loss of weight, and by the terminal stages, swollen spongy gums with fungating masses projecting beyond the biting surface of the teeth, which themselves may loosen and fall out. Purple spots are seen on the feet and ankles due to bleeding from blood

vessels and this is followed by large spontaneous bruising arising all over the body, especially on the legs. There is almost always some infection of the gums and where this occurs there is an offensive smell on the breath (Passmore & Eastwood 1986 p.321). Stress and exertion increases the rate at which vitamin C is used up by the body (Norris 1983) and so examples of sieges or harried, underfed armies, particularly after long sea voyages, are likely to provide cases of scurvy.

This account gives interesting information regarding the practice of surgery by the barbers in the camp. The excision of superfluous tissue forming on the gums is a procedure which was described well before the crusades by authors such as Albucasis (Habib Khan 1983). The fact that screams were heard around the camp during the operations on the gums suggests that neither analgesia nor anaesthesia was being used. The use of opium and other drugs (such as dwale or the soporific sponge) to make surgery less horrific for the patient is described in medieval medical manuscripts (Olivieri 1968; Voigts 1992). However, it seems clear that little or no use of such drugs was made on this occasion. If they had been used then these battle hardened soldiers would surely not have been screaming in pain the way they did. There are several possible explanations for this. One option is that that pain killing drugs were reserved for major operations and a quick trim of the gums would not have been classed as major. Another alternative is that with such large numbers of sick to treat, the surgeons were overwhelmed with work. They would not have had the time to give the drugs to each soldier and wait for them to become drowsy before performing each operation. It is also possible that after months of battle the doctors may have treated so many injured that they had run out of most of their drugs and so had no pain killers left.

Interpreting the Evidence

The evidence gathered has formed a significant source of textual information on weapon injuries and their treatment in the Latin East. This allows a number of conclusions to be drawn regarding the experiences of soldiers who fought in the twelfth and thirteenth centuries. Attempts at objectively assessing the mortality in three crusading armies have given surprisingly similar results. In the upper echelons of the crusader armies at least 25-35% seem to have died in tough expeditions lasting two or three years. About half of the deaths were a consequence of injuries and half were because of malnutrition and infectious disease. A considerably higher proportion of foot soldiers would have been expected to die on account of their limited armour and reserves of food.

The most common injuries in pitched battles were from arrows and crossbow bolts. In the course of just a single engagement it is common to hear how many individuals suffered multiple arrow injuries, to the point where soldiers resembled hedgehogs. Arrows often rained down in showers that made it very difficult for a soldier to avoid them. While their armour gave some protection, the sharp tips were able to penetrate the links of chain mail and cause penetrating injuries. The jerkin of padded cloth (*gambeson*) was a useful protective garment against the arrow, as Lord Joinville discovered at Mansourah on the Seventh Crusade.

While the sword and mace were certainly very effective, the lance used on horseback appears to have been the most formidable and lethal of weapons. The closed ranks of the heavy Frankish cavalry were extremely effective in the early years of the twelfth century (Bennett 1992) and when such charges failed in later times it was often because the opposing army opened a path for them to ride through, to avoid meeting the attack. The reason that the lance was so effective was that it still had the penetrating tip, as did the arrow, but carried with it much more energy. It was heavier than these airborne projectiles but still moved at speed because of the momentum gathered by the cavalryman on horseback. It was common to

hear of the lance penetrating body armour and on occasions coming right out the other side of the target. When this penetrating power was combined with the ability to guide the weapon up to the last minute, unlike the arrow, then a higher proportion of injuries might be expected to be in mortal areas of the body. It is common to read of survival after several arrow wounds but extremely rare after multiple lance wounds. The sword and mace were still invaluable in close quarter fighting when the horse was able to move little, but at a gallop the lance was a deadly weapon.

The evidence for the practice of surgery in armies of both crusaders and Frankish settlers provides a range of fascinating information. In many cases the textual record shows that doctors were called to an injured person and treatment given, but frustratingly little detail of the management may be included. In these situations we can only make educated guesses as to what procedures or medications were employed based on the recommendations in medical texts of the time. However, a good range of examples were also found where details of the treatment were recorded. This information tells us what treatments were actually being used to treat the injured, rather than blindly assuming that what the highly educated medical authors wrote in their books was always put into practice.

The bandaging of wounds, burns and fractures along with the application of poultices is mentioned on many occasions throughout the texts. Bandaging was a simple technique to learn and may well have been applied by the common soldier as well as medical practitioners such as barbers and surgeons. It is not known if there was a formalised network of battlefield orderlies as occurs today or if new soldiers just learnt the basics of wound care from their more experienced comrades. In the absence of evidence for the former option it seems possible that the latter may well have been the case. Poultices were applied to the injured although no details of their composition were included in the relevant passages. Interestingly, there was contradictory advice in medical texts as to whether poultices should be used on

fresh weapon injuries. Theodorich Borgognoni recommended wine or vinegar to wash the wound followed by bandaging, without a poultice. However, he did advise the use of a poultice in abscesses and to make pus appear in old wounds 'which the effect of air had already changed' (Theodorich Borgognoni 1955 vol.1, pp.13, 54). Arnold of Villanova writing at the end of the crusades recommended that a powder from certain herbs be applied topically to weapon injuries once they had bean cleaned (McVaugh 1992), so he appears to have been an advocate of the poultice even in fresh wounds. Burns were treated differently to weapon injuries in the medical texts and they differentiated between burns with and without blistering. Although the topical use of wine on wounds is described by both European and Middle Eastern medical authors (Theodorich Borgognoni 1955 p.54; Avicenna 1930 p.520) there are no actual examples of this technique identified in these anecdotal descriptions. Frankish laws refer to the correct management of long bone fractures with plasters and show that those surgeons who crippled people by their inability to manage fractures properly were punished, in some cases by amputation of their thumb.

Likewise, there were standards set for the management of skull fractures. Those surgeons who were unable to safely remove dangerous pieces of bone were hung if their bungling resulted in the death of the freeman. It is interesting that the surgeon was expected to get this operation right. A number of the laws suggest that it was acceptable to fail to cure the patient, as in the case of measles or ulcers, so long as accepted techniques were employed (Assises de Jerusalem 1843 p.167-9). The fact that skull fracture was not included in this bracket suggests that the operation was normally performed without killing the patient. If everyone with this injury died then head injuries would most likely have been included in the no fault category along with measles and ulcers. This suggestion is supported by the evidence of healing in many excavated cases of trepanation from Europe. As operating around the brain was clearly going to have some element of risk, this might imply that the advice on careful

selection of patients prior to surgery was generally performed. A patient with no brain damage prior to surgery would be expected to have recovered much better post-operatively than someone comatose even before the surgeon arrived.

The removal of arrows was clearly a common activity in the army. There are frequent references to soldiers hit by a number of arrows and by the next day they were referred to merely as wounds. It might be presumed that basic attempts to remove the arrows would be made by the soldier himself or his colleagues and that only those that were difficult to remove would have been sent to the barber or surgeon, but there is no firm evidence for this in these sources. Medical texts describe a number of techniques to assist the extraction of an arrow (Theodorich Borgognoni 1955 vol.1, p.85; Paterson 1988; Lang 1992) which was often difficult on account of the barbs, but unfortunately no details of the techniques employed were mentioned in the battlefield descriptions here.

Bloodletting may have been used in a limited way in the management of trauma as many of the injured had already lost significant amounts of blood. However, crush injuries where no overt blood loss had occurred were managed with bloodletting, such as in the case of Lord Walter of Autreche. Texts on the use of bloodletting did advise that phlebotomy from a part of the body distant (termed revulsion) to a source of significant blood loss could actually stop the bleeding by diverting the blood elsewhere (Brain 1986 p.13-4; Theodorich Borgognoni 1955 p.61-2). Balancing this, weakness was regarded as a significant contraindication to the use of bloodletting (Voigts 1984 p.56-7) and this reason is often cited in crusader chronicles for not performing bloodletting on a sick patient. It may have been a more common treatment in the weeks of recovery following injury rather than on the battlefield itself.

The example of mass surgery by barbers on the Seventh Crusade to Egypt in 1248-50 gives a particularly vivid description. The excision of the gums that had overgrown due to

severe scurvy was apparently undertaken without the use of effective pain relief and left chroniclers with the memory of the screams of the soldiers echoing around the camp. It is not clear if this episode shows that analgesia was not used at all, if it was only used in major operations, if it was only used by better trained surgeons (*cirurgici* and *medici*) or if they had simply run out of drugs after such a long campaign. Analgesia and anaesthesia had been described in both eastern and western medical texts by this time (Theodorich Borgognoni 1960 vol.2, p.212; Avicenna 1930 p.413) and there are references in Frankish sources describing the best type of opium for doctors to buy (William of Tyre 1943 vol.2, p.330). It remains unclear under which circumstances opium and other pain killers might have been used in the Latin East.

There was also a fascinating case of early twelfth century medical experimentation when King Baldwin I sustained a penetrating injury. The doctor called to treat the king was clearly not sure exactly what organs might have been damaged and hoped to dissect a Muslim prisoner, given a similar wound, so he could understand the injury better. In the end a dancing bear was dissected instead and the king did survive. It is not known if he then underwent an operation at the hands of the doctor or if supportive treatment such as wound care, dietary modification and oral medication were used.

Another more surprising aspect was the apparent use of poison on weapons at that time. The accusation that someone died from poisoning was common in the era of the crusades, especially if there was any suspicion as to the cause of death or if enemies had much to gain (William of Tyre 1943 vol.2, p.117; Continuation of William of Tyre 1996 p.44; Tritton 1933). It is easy to dismiss all these claims as fanciful since none of those in Frankish sources give any symptoms to suggest poisoning with a particular substance. Doctors clearly thought that poisons were used on the battlefield and Arnold of Villanova mentions how to treat them in his *Regimen Almarie* (McVaugh 1992). What is more interesting is that Emperor

John of Byzantium may have wounded himself while on a hunting trip with an arrow that was deliberately dipped in poison, although gangrene has also been suggested as an alternative diagnosis. His doctors even offered to amputate his hand in an attempt to save him, so they clearly knew how effective such poisons could be. With evidence such as this, it is possible that some of the descriptions of attacks where arrows or knives were claimed by chroniclers to have been dipped in poison might have been correct.

The evidence for the practice of surgery in Islamic armies is again interesting. On a number of occasions texts mention the use of sutures by indigenous surgeons to bring together the edges of wounds. Although it is presumed that the materials used would not have been sterile, when long-term outcomes are given they often suggest that the wound healed satisfactorily. It could be argued that a bad infection would have killed the patient and so only those who healed well might be alive for any comment on long-term healing. However, the evidence does suggest that this technique may have been reasonably standard practice and had some success in certain parts of the body.

With all these examples of surgery it would be ideal if comparison could be made between treatment practiced by European trained crusaders and the techniques of the indigenous practitioners who had trained in the eastern Mediterranean. It is a commonly held belief today that the Franks were of poor standard compared with the indigenous practitioners. However, the evidence for such an assumption is extremely flimsy. The definitive approach to allow comparison between European and indigenous practitioners might be to look at the success and failure rates of each group, but this is not possible using textual sources as such information was just not recorded. An archaeological approach may be possible in the future, where injuries on human skeletal remains from Frankish cemeteries could be compared with those of comparable socioecconomic status from non-Frankish areas. If the tibia fractures healed straight in one group and angulated in the other this might suggest

variation in the ability to treat such fractures. However, even this approach may be limited by the presence of the indigenous practitioners that were treating the Latin population. Another line of inquiry would be to assess multiple, detailed textual examples where practitioners from each group were treating similar injuries, and this would highlight the similarities and differences in their approach. Unfortunately such data is not yet available. In many of the cases described above the origin of the treating practitioner is unknown, and modern educated guesses may be incorrect. Furthermore I have been unable to identify examples where members of each group are treating the same type of injury, where sufficient details are given to enable meaningful comparison. Certainly an approximate assessment of the general type of procedures and techniques can be made and used to compare the two groups. By this final criteria there is little evidence to suggest that typical practice by crusaders, Frankish settlers or indigenous Christians, Jews and Muslims was dramatically different.

Having discussed what was found in these descriptions, it might be work considering what was not found. Reasons for the absence of certain treatments from the record can be interpreted in a number of ways. Perhaps the first reaction might be that if a treatment was not mentioned in these sources then it might not have been practiced at that time. In some examples this may have in fact been the case, but alternative reasons should also been considered. It is possible that some procedures were so common that no one bothered writing the details down in a chronicle. This is a plausible argument as to why there was an absence of reference to the use of cautery in the treatment of trauma. This is presumed to have been popular among Islamic doctors on account of the large sections discussing the technique by Albucasis (Albucasis 1973) and to a lesser degree Avicenna (Avicenna 1930 p.525), but it was also included in European texts (Theodorich Borgognoni 1960, vol.2, p.36). Using hot iron was thought useful in trauma cases with bleeding and gangrene, so it is surprising that

there were no examples of its use identified. However, cautery was mentioned in Frankish laws with regard to elective procedures such as haemorrhoids (Assises de Jerusalem 1843 p.167-9), so it may well be that the technique was in fact used. Another theory to explain the absence of certain techniques is that the chroniclers may not have seen the more complicated operations being performed. These might well have taken place in the privacy of a battlefield tent, so that the only information the chroniclers could write was that treatment was given and the individual either died or recovered. This reason must be considered when it is noted that there was no examples of surgical treatment of abdominal injuries with a description of damaged intestines and this was well known to have been a very grave injury. It is not known if the surgeons would attempt to suture the intestines as described in medical texts (Theodorich Borgognoni 1955, vol.1, p.154; Albucasis 1973 p.536-50), or if the patient was merely left to die from peritonitis without any attempts at surgical intervention. However, there are some examples of attempts to treat such wounds in medieval Europe (Lang 1992). Unlike an elective operation on the abdomen, the surgeon would surely not be blamed if the patient died after surgery for such an injury as patients were known to invariably die in any case if left untreated. While we do have examples of abdominal injuries undergoing treatment, such as King Baldwin I after the bear was dissected, the lack of detail subsequent to this suggests that the eyewitnesses who gave the rest of the story to the chronicler were kept out of the tent where the treatment took place.

This approach has demonstrated a wide range of treatments used in the management of weapon injuries resulting from medieval battles. The interaction between weapons, armour and injuries has been explored, the mortality in crusader armies estimated and the most common and most lethal weapon injuries discussed. The evidence for the practice of surgery has been compared with techniques recommended in the medical texts of the time. It seems that treatment for common weapon injuries was similar to the approach advocated in the

medical texts. However, evidence for complicated and dangerous procedures such as chest and abdominal surgery is not found in the non-medical sources used here. Whether it is simply due to chance that such procedures were not recorded, whether such procedures were just not performed in public view for the chroniclers to watch or whether this really suggests that such operations were not undertaken at all is open to discussion. It may well have been a mixture of all these.

Conclusion

The evidence discussed so far is not merely informative for the historian but gives a vivid picture of the harrowing experiences of the medieval soldier. The information can be studied in a cross-sectional manner with comparisons between different regions, or using a time dependent approach to highlight how the situation changed over the two hundred year history of the kingdoms. A broad range of sources, both textual and archaeological, has been consulted in order to obtain as objective and accurate a view as possible. Rather than just relying on one type of evidence, consulting such varied sources reduces the chance that conclusions will be inaccurate and misleading. Just because a statute is included in a legislative code does not necessarily mean that it was implemented, but complementary evidence in personal letters or other documents gives the kind of support that shows it should be taken seriously as evidence. The integration here of the information relevant to trauma, surgery and medical treatment in the crusades has demonstrated a fascinating aspect of life in the medieval eastern Mediterranean that was little understood before now.

Over sixty medical practitioners have been identified who are believed either to have participated in a crusade or spent time in the Frankish states. Those from Europe came from France, England, Italy, Hungary, Spain and elsewhere while local indigenous practitioners represented the eastern Christian, Jewish and Muslim communities. The evolution in terminology that took place in twelfth and thirteenth century Europe is mirrored in the crusader references. By the end of the twelfth century records confirm not just the multi-skilled *medicus* but the introduction of specialised surgeons, barbers, bloodletters and apothecaries as well as the educated *physicus*. A considerable number of the *medici* and *physici* were clerics but none of the surgeons were in major orders and the barbers, bloodletters and apothecaries do not appear to have been from a religious background.

Despite the widely held view that surgeons were not academically trained to a high standard in the medieval period, several of the thirteenth century surgeons had the title master which does suggest an university training. Some took the cross and joined a crusade as they chose to of their own free will but many others in the service of a patron had no choice but to accompany their local nobility on the expedition. The best known accompanied kings and nobles and so were recorded in the chronicles but many more who came with the armies remain anonymous. Their duties ranged from advising clients on a suitable diet to maintain health, performing bloodletting, prescribing medicines, treating weapon injuries, assessing whether someone was too ill to attend court hearings, signing legal documents and even preserving and transporting the bodies of dead nobles back to Europe for burial at home. Often they stayed in the east for just a year or two before returning, but some settled in the Latin East.

Hospitals in the medieval period varied greatly in their purpose and function. The Byzantine Empire and Islamic world did possess institutions (the *xenon* and *bimaristan*) where medical care was provided for the sick by medical practitioners, comparable with the understanding of the term hospital today. However, in early medieval Europe the 'hospital' (*hospitale*) provided accommodation and spiritual care for members of the local population, often termed 'medicine for the soul'. Treatment of physical illness by medical practitioners in these institutions was not typically regarded as an appropriate function until the thirteenth century. Those hospitals established by the Franks typically followed European expectations of such institutions in their early years but interestingly some of them are seen to evolve over time to become more like the Byzantine and Islamic hospitals, providing medical care. The most notable of these were the hospitals of St. John but others were run by the German Teutonic Order, the English Order of St. Thomas of Canterbury and the Order of the Temple. While the Templar infirmary just provided for the care of sick and wounded

members of their own religious community, the others took in local citizens, pilgrims and soldiers of the appropriate country of origin who were in need of medical assistance. Statutes record treatment by dietary modification, bloodletting, drugs and surgery, all in a religious setting with confession on arrival at the hospital and daily prayers and regular masses. To complement the hospitals built in the major towns, mobile field hospitals also accompanied the army. By the 1180s the hospital of St. John sent four surgeons and other staff with the army and performed treatment of the wounded in tents transported by pack animals. In the longer sieges beleaguered soldiers sometimes established impromptu field hospitals constructed from dismantled ships. Medical staff in Frankish hospitals were not restricted to European Christian practitioners and variation in the forms of oath taken by new doctors suggests that they probably employed locals of any religion. There is no direct evidence to show for certain which influences triggered the addition of medical treatment to the original functions of Frankish hospitals, but indirect evidence from study of dietary regulations suggests that it was probably the adoption of influences from the eastern Mediterranean. However, they did not simply become a copy of a xenon or bimaristan but a hybrid of east and west, providing accommodation to pilgrims and food for the starving as well as medical care to the sick. The introduction of medical care begins to be seen in European hospitals in the thirteenth and fourteenth centuries and it has been suggested that this resulted from the crusaders who returned home to tell of their experiences.

Textual evidence for weapon injuries and emergency surgery has been particularly illuminating. It seems that about 15-20% of the nobility might die from wounds in a long campaign of two or three years and a similar figure from malnutrition or infectious disease. We might expect the numbers of poorer foot soldiers to be significantly larger on account of their less effective armour and limited financial resources to buy food in times of famine and pay for medical care when wounded. The most deadly weapon was the lance as it could

penetrate chain mail, pass deep into the body and could be accurately guided to the target. The most common injuries were from the arrow and crossbow bolt and although they were less lethal they did have advantage to the attacking soldier of allowing him to stand well away from the enemy. Hand-held weapons such as the sword and mace were most useful in close combat when a horse could not gain enough speed to make the lance effective. Evidence for the battlefield treatment of weapon injuries included application of poultices and dressings, the suturing of wounds, extraction of arrows and bloodletting. Other Frankish sources mention manipulation of long bone fractures and holding them in plaster, cranial surgery for skull fracture and amputation of a limb. There is even a vivid description of the mass surgical excision by barbers of overgrown gum tissue resulting from scurvy in soldiers in a besieged army camp. Another very important find is an early description of dissection dating from around 1103 following the wounding of King Baldwin I of Jerusalem. While the king's doctor asks to be allowed to dissect a Muslim prisoner, a compromise is reached where a bear is dissected instead and the king did survive his treatment. This was at a time when dissection of human cadavers is not thought to have been taking place in Europe. The evidence for surgery to the chest and abdomen is limited and this may have been a result of limited access by chroniclers to the operations themselves or may suggest that such procedures were rarely undertaken as they would have been high risk procedures. In general, the treatment of trauma does appear to have been comparable with that advised in surgical texts of the period with regards to the limbs and head, although there is much less evidence for the use of the more invasive procedures in the chest and abdomen.

This evaluation of surgical practice for trauma in the Latin East is highly illuminating from a number of perspectives. At the most basic level it illustrates how European practitioners functioned on military campaigns and how the sick were treated in battle, but if we look more closely it can tell so much more than that. Perhaps the most

fascinating aspects are how the practitioners coped with life within the Frankish states, interacting with the local population and improved their own practice by adopting novel approaches to health care that existed in the eastern Mediterranean on their arrival. If it is possible to summarise the evolution in medical care that took place during the lifetime of the Frankish states then comparison between military medicine at the start and end of the crusader period might be the simplest way. The practical recommendations for military health care contained in Arnold of Villanova's *Regimen Almarie* of 1310 (McVaugh 1992) must have evolved out of the harsh lessons learned on almost any medieval expedition, be it a crusade to the Middle East or Spain or alternatively in battles between rival kingdoms in Europe itself. Had these rules been written two hundred years earlier then perhaps many of the worst moments in the history of crusading warfare might have been avoided. The huge death toll from infectious disease in the First Crusade's siege of Antioch, in part a consequence of mosquitoes from the nearby marshes (Albert of Aachen bk3 ch40), and the floating dead in the water supply in the Seventh Crusade at Mansourah in Egypt (John of Joinville 1955 p.96-7) are perhaps two of the most noteworthy. Certainly, by the beginning of the fourteenth century there seems to have been a much greater awareness of how to minimise unnecessary deaths in an army on the march than was the case when the crusades began two hundred years before. Medicine in the Mediterranean world changed hugely from the eleventh to fourteenth centuries and the crusades must surely have played an important role in this transformation.

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