Facilitating Improved Performance of Junior Hospital Pharmacists in a Large Tertiary Singapore Hospital Using an Adapted Competency-based General Level Framework for Evaluation, Feedback and Direction of Needs Based Learning

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ABSTRACT

Objective
This work aimed to evaluate the acceptability and validity of a Singapore-adapted GLF as a tool for facilitation and evaluation of performance development in a group of general level hospital pharmacists in a large tertiary Singapore hospital.

Methods
A prospective cohort study was conducted. Observational evaluations during daily clinical activities were recorded for 35 pharmacists using the GLF at 2 time points over a median of 9 months. Evaluations were followed by feedback; from which individualized learning plans were formulated.

Results
Mean competency cluster scores improved for all 3 clusters and in all competencies. Of 63 behaviors, all but 8 showed significant improvement ($p \leq 0.05$). Non-significant improvements were due to the highest level of performance being attained upon initial evaluation. The GLF process was a positive experience, prompting reflection on practice.

Conclusions
A Singapore-adapted GLF was an acceptable educational tool for the facilitation and evaluation of performance development in general level hospital pharmacists.

Keywords: competency, pharmacist, General Level Framework, Singapore, hospital pharmacy

INTRODUCTION

Hospital pharmacists are essential members of the multidisciplinary team who promote rational and cost-effective use of medicines, and improve patient outcomes by reducing morbidity, mortality, adverse drug events and hospital length of stay.[1-8] The role of pharmacists using evidence-based practice to ensure patient safety and the best use of medicines has been endorsed by the World Health Organization (WHO) and government bodies at a global level.[9-11] There is pressure on pharmacists to deliver these improved patient outcomes in all developed and developing countries as the burden of disease increases as a result of an aging population with multiple co-morbidities. To maximize improved patient outcomes it is essential to have an adequate supply of appropriately educated and clinically skilled pharmacists.

Singapore
The Singapore government has responded to this changing landscape by increasing staffing levels of health care professionals by 40%, including funding extra pharmacists, whose clinical role in Singapore is being increasingly recognized and developed.[12,13] The majority of hospital pharmacists in Singapore are currently relatively junior, with approximately 65% having less than 3 years experience. It was identified that a regular structured clinical mentoring and practitioner development system that included standards for practice, self reflection, peer evaluation, feedback and directed learning would be of additional benefit to the academic post-graduate opportunities already available.

In a recent survey of the Australian Hospital Pharmacy workforce, a third of pharmacists indicated that they would leave the department within 2 years if support for staff development were not available.[14] A structured, robust, evidence-based tool for practitioner development could assist in ensuring a competent work force and act as a primary motivator to increase job satisfaction and hence retention. Such a tool could also identify common development areas for an entire cohort and direct training programs as well as enabling departments to set and monitor service standards.

General Level Framework
While no single model may be appropriate for all cultures and contexts, there are significant global health and labor market drivers that suggest a competency-based approach is sensible and sustainable for workforce development.[15-17] The Competency and Education Development Group (CoDEG) in the UK used the Whiddett and Holyforde model as a basis for developing a competency-based performance development framework for general level pharmacists (those with less than 3 years post-registration hospital experience).[18-21] The general level framework (GLF) was developed as a ward-based tool to facilitate the development and evaluation of pharmacists via direct observation of their practice.[22] This process was subsequently validated in general level hospital pharmacists in the UK by Antoniou, et al, who demonstrated that practitioners who received feedback on their performance and agreed a development plan using the GLF up to 3 times in a 12 month period reached (and maintained) a defined level of competence faster than those who were observed without this intervention.[23]

Since then, similar frameworks have been developed globally, which have also demonstrated contributions to achieving and measuring improvements in performance over time in both hospital and community pharmacy settings.[24- 29] In fact, such is the current global interest in efficient programs for development and evaluation of competencies for pharmacists, that the International Pharmaceutical Federation (FIP) formed an ongoing partnership with WHO and United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2008 (Global Pharmacy Education Taskforce www.fip.org/education) which included an objective to develop a globally acceptable competency framework.[16,30,31]

There are similarities between the role of a hospital pharmacist in Singapore when compared to the UK and Australia. Therefore GLFs from the UK and Australia were reviewed, and components from each adapted for use in a large tertiary Singapore hospital by selecting and mapping relevant GLF competencies to the applicable Singapore Pharmacy Council competencies.[19,25,32] A working group of junior and senior pharmacists who would be using the tool were consulted on the draft, a pilot was conducted and revisions were made according to feedback. The final adapted GLF consisted of 63 behavioral statements grouped within 14 competencies and distributed into 3 competency clusters: Delivery of Patient Care, Problem Solving and Professional (Tables 1-3). The performance level for each behavior related to frequency of their demonstration: 'rarely', 'sometimes', 'usually' or 'consistently'. The adapted GLF was initially introduced at one large government hospital in June 2009, with a view to extending this to the other SingHealth Institutions before being adopted island-wide.[33]

Objective
The aim of this prospective cohort study was to evaluate the acceptability and validity of the adapted GLF as a tool for the facilitation and evaluation of performance development for a group of general level pharmacists in a large tertiary hospital in Singapore.

METHODS

Training
The 8 GLF facilitators at the study site attended 2 in-house training afternoons introducing the concepts of the GLF as a tool for performance development, evaluation and feedback. Practical application was addressed further whereby 2 (super trainers) of the 8 facilitators attended 2 half-day training seminars led by CoDEG and Medication Services Queensland (MSQ) on principles of adult learning, effective feedback and practical use of the GLF plus associated tools. Following this, each super trainer conducted a self-evaluation using the GLF before observing a member of CoDEG or MSQ complete a GLF evaluation and provide feedback to themselves and a peer. Super trainers were subsequently responsible for providing training to others at their site of practice. Each super trainer completed a feedback questionnaire.

All general level pharmacists at the study site attended an in-house training afternoon on the principles of the GLF and associated professional development tools. Additional

seminars on workplace education and work-based learning were provided by CoDEG and MSQ, and attended by most GLF pharmacists at the study site. Feedback was sought from the facilitators and general level pharmacists at regular intervals.

Study design

Thirty-five general level pharmacists working in the inpatient setting at one large tertiary hospital in Singapore were enrolled into the study. GLF facilitators required general level pharmacists in their clinical team to conduct a self-reflection on their current level of performance using the GLF. This tool was subsequently used to conduct baseline and repeat observational evaluations during daily clinical activities; followed by feedback, from which individualized learning plans were formulated. All pharmacists underwent a minimum of 2 evaluations over a median of 9 months. At each visit, the performance of the individual for each behavior was rated from 1 to 4 (1=rarely; 2=sometimes; 3=usually; 4=consistently). If a behavior was not observed it was categorized as 'not assessed'. Baseline scores were calculated from the first evaluation in the study period and repeat scores were calculated from the last.

Data collection and analysis

A password-protected database was created on Excel (2003) and the facilitators entered results for each GLF evaluation.

For each behavior median scores and ranges were calculated, and the difference between individual baseline and repeat observed performance was analyzed using the Wilcoxon paired signed-rank test. Mean scores for competency clusters and competencies were compared to illustrate the change in performance from baseline to repeat visit. Analysis was carried out using the Statistical Package for Social Sciences (SPSS version 17).

Ethics approval was applied for and waived by the study site's Institutional Review Board.

RESULTS

Thirty-five general level pharmacists working in the inpatient setting at a large tertiary hospital in Singapore underwent baseline and repeat observational evaluations between June 2009 and December 2010.

All but one of the pharmacists enrolled in the study were female (97%). At baseline, pharmacists had a median of 2 years post-registration experience (range 1 to 4). The median time to repeat observation was 9 months (range 4 to 10), and pharmacists had a total median of 3 observation visits (range 2 to 4).

An improvement in the mean competency cluster score was demonstrated for all 3 clusters (Fig 1) and in all competencies (Figs 2-4) from baseline to repeat evaluations.

Of the 63 behaviors analysed, all but 8 showed significant improvement ($p \leq 0.05$) between baseline and repeat observations (Tables 1-3). In all cases, non-significant improvements were the result of pharmacists being perceived to already be practicing at the highest performance level upon the initial baseline evaluation. No decrease in performance was demonstrated in any behavior.

The most significant improvements in performance were seen in the Problem Solving cluster (Fig 3), where all behaviors demonstrated a significant improvement. Baseline and repeat median scores were also generally lower in this cluster compared to the others (Table 2). Problem Solving competencies included behaviors relating to: problem identification, knowledge, analysis and recommendations and follow up.

Six of the behaviors that failed to demonstrate significant improvement were in the Patient Care competency cluster; 5 of these related to the provision of medication competency and one to the patient education competency (Table 1). All other Patient Care competencies (patient consultation, gathering information, drug specific issues and risk management and service improvement) showed a significant improvement.

The 2 other behaviors that failed to demonstrate significant improvement were in the Professional cluster, relating to confidentiality and recognizing the value of team members, which were categorized within the professionalism and teamwork competencies (Table 3). The remaining 2 Professional competencies; organization and communication skills, did show significant improvement.

Of the 21 year 1 and 2 general level pharmacists at the study site who underwent the first round of evaluation with the GLF, 81% agreed that it 'added value to their learning experience'. Comments from the super trainers highlighted that the GLF process was an overall positive experience that prompted refection on practice, although some found the process to be taxing (Fig 5).

DISCUSSION

The adapted GLF was well received and proved a useful educational and development tool that was able to demonstrate improvement in performance over time. The majority of general level pharmacists to whom the tool was applied at the study site felt positively about the contribution it made to their learning experience. Feedback from the super trainers was very encouraging and indicated that the whole GLF process was well received as a way to evaluate many different aspects of practice (attitudes, knowledge and skills), provide inspiring and practical feedback on practice and prompt reflection (Fig 5). The perceived negative aspects were few, though some felt uncomfortable being observed and giving feedback to a peer and others found the process taxing, a sentiment echoed by colleagues in the Queensland study.[24] Both of these aspects are things that become easier with time as the GLF becomes integrated into daily practice and as a more open learning culture develops.

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Anecdotally, many pharmacists found the process of self-reflection almost as important as the observed evaluation and feedback process. The process of self-reflection (which forms a significant component of the GLF) is important to facilitate a greater understanding of defined and accepted expectations and is consistent with adult learning principles (self-reflection, feedback and needs-based learning).

Of the 63 behaviors analysed, all but 8 demonstrated a significant improvement between baseline and repeat observations. In the 8 cases where no significant improvement was observed, it was the result of pharmacists being perceived to already be practicing at the highest performance level during the baseline evaluation. The competencies this applied to related to tasks that were widely accepted to comprise fundamental roles of a hospital pharmacist in Singapore, an observation that was reflected in other studies.[23,24]

Problem Solving competency cluster
The behaviors in the Problem Solving cluster all demonstrated a significant improvement, and also the largest change in performance over time out of the 3 clusters (Table 2). This reflects research findings from other countries using this tool and emphasizes the large growth in problem solving skills that take place in the first years of practice.[23,24] This cluster measures more knowledge-based behaviors, such as describing the pharmacology of drugs, pathophysiology of disease and mechanisms of interactions, which require a more complex understanding and continual learning, compared to the process-based behaviors that comprise the majority of the other 2 clusters. The process-based behaviors that involve the learning and refining of processes related to daily activities appear to be mastered faster, compared to knowledge-based behaviors, which are in effect subject to continual improvement and can only be fully refined over time in conjunction with appropriate mentoring and continued professional development.[15]

The lower median scores demonstrated in the Problem-Solving cluster, compared to the other 2, suggest that this cluster may show the greatest improvement from continual mentoring and guidance. It also highlights the gap between theory learned at university and during the pre-registration year and application to practice. The UK has addressed this with the introduction of a self-directed type Diploma in General Level Pharmacy Practice, which incorporates the GLF to support the development of junior pharmacists, using work-based learning and case-based assessments under the mentorship of a more experienced practitioner.[34] In response to the learning needs identified by the GLF, all pharmacists at the study site were divided into clinical teams, with a senior pharmacist designated to lead the team. The team met each week to discuss cases, share learning experiences and to review GLF training needs.

Patient Care competency cluster
Eighteen of the 24 behaviors in the Patient Care cluster demonstrated significant improvement in performance, including the behaviors around medication history taking and allergy documentation (Table 1). When carried out by pharmacists, these activities have been demonstrated to be more complete and result in reduced mortality.[7,35-37] These are therefore essential components of a clinical pharmacy service and it is important that performance in these behaviors is maximized to improve patient outcomes.

Six of the behaviors that failed to demonstrate significant improvement were in the Patient Care competency cluster. Five of these related to the provision of medication, and included ensuring that the: prescription was unambiguous and legal, medication label contained the required information, correct drug, patient and label were provided and medication supply was documented. These supply-related behaviors are traditionally seen as some of the most well established roles of the pharmacist and were being performed at the highest level at the baseline evaluation. Interestingly, 'ensuring medication availability', 1 of the 5 behaviors within the provision of medication competency, did show significant improvement, suggesting that this was perhaps not as obvious a role for the general level pharmacist as the other 4 supply-related behaviors, and highlights how the GLF can be a useful tool to set standards and ensure uniform provision of services.

A similar trend was seen in the behaviors relating to the patient education competency, where provision of appropriate oral/written information did not show a significant improvement over time due to the high level of baseline performance, but the advice on non-pharmacotherapy treatments and assessing the patient's understanding of the information they had been given did show improvement. 'Advice on non-drug therapy' scored a median of 3 at both time points, and though as significant improvement was demonstrated it was the lowest scoring behavior in the patient education competency. This raises the question of whether it is necessary for pharmacists to be aiming for the top performance level in all behaviors or if a department may wish to prioritize by setting minimum standards of performance depending on staffing, expectations and targets.

Professional competency cluster
This cluster was the highest scoring of the 3 on repeat evaluation and contained the final 2 behaviors that failed to demonstrate significant improvement. These behaviors related to confidentiality and recognizing the value of team members (Table 3). Again, performance was already considered to be at the highest level upon the baseline evaluation, suggesting that these values were instilled early in a pharmacist's career. The 2 behaviors in this cluster that ranked the lowest at both time points were, 'demonstrates confidence' and 'active in educating and training healthcare professionals'. It is possible that these 2 behaviors are linked, and pharmacists will become more involved in education and training as they gain experience, and therefore confidence.

Benefits of the GLF
Clinical pharmacy services positively impact on patient care in many ways, including reducing mortality.[1-8] The GLF describes the behaviors and activities that this service should comprise. Many competencies will be common requirements to all environments, countries and cultures providing pharmaceutical care to patients, whilst others can be adapted according to need and local requirements. Some behaviors describe good practice, such as 'opening the consultation', whilst others set standards that reduce morbidity, mortality and re-admission rates, for instance 'allergy documentation' and 'medication reconciliation'.[7,35] Other behaviors provide cost-effective care or reduce potential unwanted effects, such as 'ensures need for drug' and 'identify drug-drug interactions', respectively.[1-6] Demonstrating significant improvements in performance

not only drives improvements in patient care but also provides a framework for clinical governance.

The GLF demonstrated improvements in performance over a median time of 9 months, demonstrating that it is a valid tool for the measurement of performance over this timeframe. There was also potential for further performance improvement after 9 months, suggesting that this tool would be a valid development aid beyond this time period.

Impact of the GLF in Singapore
This is the first time the use of the GLF has been analysed in an Asian setting. The introduction of this tool was received with generally positive feelings in a culture where knowledge-based assessment is traditionally favoured over competency-based programs. However, a shift in thinking is occurring and the value of individualized competency-based development in addition to (not instead of) academic merit is being recognized by many of the most influential clinical pharmacy leaders in Singapore, with the GLF now adopted by a significant number of public healthcare institutions, with the others to follow in the near future.

Initially pharmacists were nervous at the thought of having their practice observed, but also quite excited at the prospect of having help from a more experienced mentor to develop their practice. Pharmacists are traditionally used to working alone and it is rare to have someone observe practice after the initial training period. Whilst hands on training and observation are key components to the post-graduate development and training of medical staff and other health care professionals in Singapore, clinical pharmacists have largely been left to develop (and in many cases pioneer) their own practice. Some thrive on this challenge, but many others require more support, empowerment and instruction.

Another argument in the support of observing professional practice is that all practitioners should be open to having their practice reviewed by peers. Such interaction provides the opportunity to ensure practitioners are providing safe and effective care to patients and to congratulate when identified goals are achieved and tasks are performed to agreed standards. This forms a pivitol role in clinical governance and the GLF can be used as an effective tool by heads of pharmacy to measure how pharmacists are performing against defined and accepted standards.

Comparison to other studies
The current study demonstrated significant improvements in 87% of all the behaviors (n=63) evaluated over a median of 9 months. This compare to 95% (n=58; $p<0.05$) at 6 months (sustained at 12 months) in the original London study, and 57% (n=61; $p<0.05$) over a median of 14 months in the Queensland study.[23,24] Whilst performance improvements are comparable between the London and Singapore cohorts, there is an obvious disparity in relation to Queensland. The competency frameworks used in the 3 studies contained different behaviors and so a direct comparison is not feasible, however some observations can be made.

The weighting of behaviors in the London and Singapore frameworks were comparable, whilst the Queensland framework had a larger focus on the Patient Care cluster (Table 4). The Patient Care behaviors in the Queensland framework were very detailed and included extra behaviors, such as: relevant patient background, patient's understanding of illness and patient's experience of medication use. These behaviors generally had lower baseline and repeat scores, perhaps indicating that other behaviors were prioritized over these.

The 8 behaviors that failed to show significant improvement in the Singapore study were due to pharmacists already performing at the maximum level upon the initial evaluation. This was true for 9 behaviors in the Queensland study (mainly relating to the Professional cluster and the discharge facilitation competency), but the remaining 17 behaviors (mainly in the Patient Care cluster) did not significantly improve, though most demonstrated a trend towards improved performance. The explanation provided for this was that these behaviors were associated with a deeper understanding of medication related consultation. Indeed, if the Singapore GLF had been as detailed, perhaps a similar trend would have been demonstrated.

Two of the behaviors that failed to demonstrate improved performance in the Queensland study also included in this study's GLF were, 'medication reconciliation' and 'mechanisms of interactions'. It is interesting that these showed a significant improvement in one country and not the other. The difference could be explained by expectations and accepted standards of practice in the 2 countries. For example, the Singapore GLF states that medication reconciliation should be done 'when appropriate', whilst this is a standard procedure for all patients admitted to hospital in Queensland. Maybe this disparity is due to time pressures, staffing levels, an understanding of the importance of this process or the level of development of clinical pharmacy practice.

Only the study's GLF contained a competency related to provision of medication, and performance of most of the associated behaviors was maximal on initial evaluation. Now that technicians have taken largely taken over the supply role in Singapore (as in London and Queensland), perhaps these behaviors could be transferred to a technician level framework.[38,39]

Limitations
The validity, sensitivity and reliability of the GLF evaluation process has previously been evaluated.[22,23] However, using such a tool is always open to individual assessor variation in expectations. It was endeavored that the same facilitator should complete all evaluations for an individual pharmacist throughout the study to reduce inter-rater variability, however on some occasions this was not possible and 20% of pharmacists had 2 facilitators. The GLF can be used as a developmental tool for individual pharmacists, independent of such variations, but the comparison of scores between individuals should be done loosely, taking this limitation into account. In response to feedback from this study, a handbook was produced as a reference for the trainers and trainees to provide more detailed descriptions of the competencies to aid standardization of the process.[33]

Feedback was obtained at regular intervals from the general level pharmacists, and 81% of those surveyed indicated that the GLF added value to their leaning experience..

CONCLUSIONS

The GLF adapted for a large tertiary hospital in Singapore was an acceptable educational tool for the facilitation and evaluation of performance development in general level pharmacists. A single framework or target level of performance may not be appropriate for all contexts, but the GLF is a useful development and evaluation tool that can be tailored to local cultural needs and expectations of an institution.

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Table 1. Evaluation of Behaviors in Patient Care Competency Cluster

Patient Care Cluster	Baseline		Repeat		
Competency/behaviors	Number	Median (range)	Number	Median (range)	Exact Sig
Patient Consultation					
- Opening consultation	35	4 (2-4)	34	4 (3-4)	0.002
- Questioning	34	3 (3-4)	34	4 (3-4)	<0.001
Gathering information					
- Allergies	35	4 (3-4)	35	4 (4)	0.025
- Relevant background	35	3 (2-4)	35	4 (3-4)	<0.001
- Medication history taking	33	3 (2-4)	35	4 (3-4)	<0.001
- Medication reconciliation	33	3 (1-4)	35	4 (2-4)	<0.001
- Consultation on inconsistencies	33	4 (2-4)	35	4 (2-4)	0.002
Provision of Medication					
- Prescription unambiguous	34	4 (3-4)	35	4 (4)	0.083[a]
- Prescription legal	35	4 (4)	35	4 (4)	1.000[a]
- Required information on label	35	4 (3-4)	34	4 (4)	0.157[a]
- Medicine availability	33	4 (2-4)	34	4 (2-4)	0.005
- Right drug, patient & label	33	4 (3-4)	33	4 (2-4)	0.083[a]
- Supply documented	33	4 (2-4)	33	4 (3-4)	0.059[a]
Drug Specific Issues					
- Need for drug	35	3 (1-4)	35	4 (2-4)	0.001
- Cost-effectiveness	35	3 (1-4)	35	3 (2-4)	<0.001
- Selection of formulation, concentration, rate & diluent	34	3 (1-4)	33	4 (2-4)	<0.001
- Administration of correct dose, frequency, timing, route & duration	35	3 (3-4)	35	4 (3-4)	<0.001
Patient Education					
- Provision of oral/written information	34	4 (3-4)	33	4 (3-4)	0.102[a]
- Advice on non-drug therapy	34	3 (1-4)	33	3 (2-4)	0.008
- Assessment of patient's comprehension	34	4 (2-4)	33	4 (3-4)	0.002
- Compliance assessment	34	3 (2-4)	32	4 (3-4)	0.001
- Need for information identified	34	3 (2-4)	33	4 (2-4)	<0.001
- Documents medication errors	35	4 (2-4)	35	4 (3-4)	0.033
- Looks to improve quality of service	35	3 (1-4)	35	3 (2-4)	<0.001

[a] Change in behavior non-significant at p=0.05 level

Table 2. Evaluation of Behaviors in Problem Solving Competency Cluster

Problem Solving Cluster	Baseline		Repeat		
	Number	Median (range)	Number	Median (range)	Exact Sig
Competency/behavior					
Problem Identification					
- Identify drug-drug interactions	34	3 (2-4)	35	4 (3-4)	<0.001
- Identify drug-patient interactions	34	3 (1-4)	35	4 (2-4)	<0.001
- Identify drug-disease interactions	35	3 (2-4)	35	3 (2-4)	<0.001
- Problem prioritization	34	3 (1-4)	34	4 (2-4)	<0.001
- Consults or refers appropriately	35	3 (1-4)	34	4 (3-4)	0.003
Knowledge					
- Pathophysiology of disease	35	3 (1-4)	35	4 (2-4)	<0.001
- Pharmacology	35	3 (2-4)	35	4 (2-4)	<0.001
- Side-effects and monitoring	35	3 (2-4)	35	4 (3-4)	0.001
- Mechanism of interactions	35	3 (1-4)	35	3 (1-4)	<0.001
Analysis and Recommendations					
- Access guidelines/references	35	3 (2-4)	35	4 (2-4)	0.001
- Analyze information	34	3 (2-4)	34	3 (2-4)	0.002
- Identify evidence gaps	34	2 (1-3)	34	3 (1-4)	0.005
- Clear decision making	34	3 (1-4)	34	3 (1-4)	0.001
- Provide accurate information	35	3 (2-4)	33	4 (3-4)	0.001
- Provide relevant information	35	3 (2-4)	34	4 (3-4)	<0.001
- Provide timely information	35	3 (2-4)	34	4 (3-4)	<0.001
- Documentation of drug related problems	35	3 (2-4)	34	4 (3-4)	0.002
Follow Up					
- Monitors drug therapy	35	3 (2-4)	35	4 (3-4)	<0.001
- Ensures resolution of drug-related problems	35	3 (2-4)	35	4 (2-4)	<0.001

Table 3. Evaluation of Behaviors in Professional Competency Cluster

Professional Cluster	Baseline	Repeat

	Number	Median (range)	Number	Median (range)	
Organization					
- Prioritizes work	35	3 (2-4)	35	4 (3-4)	<0.001
- Punctual	35	3 (2-4)	35	4 (3-4)	0.003
- Uses time efficiently	35	3 (2-4)	35	4 (3-4)	<0.001
- Demonstrates initiative	35	3 (2-4)	35	4 (2-4)	0.001
Professionalism					
- Practice within Code of Ethics	35	4 (3-4)	35	4 (3-4)	0.046
- Maintains confidentiality	35	4 (3-4)	35	4 (3-4)	0.180[b]
- Demonstrates confidence	35	3 (2-4)	35	3 (2-4)	0.002
- Takes responsibility	35	4 (3-4)	35	4 (3-4)	0.020
- Describe structure and value of organization	34	3 (2-4)	35	4 (2-4)	0.007
- Uses up to date procedures	35	3 (2-4)	35	4 (2-4)	0.001
Communication Skills					
- Appropriate communication with patient	35	4 (3-4)	35	4 (3-4)	0.002
- Appropriate communication with prescribers	35	4 (2-4)	35	4 (2-4)	0.002
- Appropriate communication with nursing staff	35	4 (3-4)	35	4 (3-4)	0.002
- Share learning, give feedback/guidance	34	3 (2-4)	34	4 (3-4)	0.007
- Education & training	34	2.5 (1-4)	34	3 (2-4)	0.001
Team Work					
- Recognizes value of pharmacy team members	35	4 (3-4)	35	4 (3-4)	0.059[b]
- Works effectively as part of pharmacy team	35	4 (3-4)	35	4 (3-4)	0.004
- Passes on relevant information to pharmacy team	35	4 (3-4)	35	4 (3-4)	0.008
- Recognizes value of multi-disciplinary team members	35	4 (2-4)	35	4 (3-4)	0.070
- Works effectively as part of the multi-disciplinary team	35	4 (2-4)	35	4 (2-4)	0.046

[b]Change in behavior non-significant at p=0.05 level

Table 4. Comparison of Performance Improvement

	Patient Care cluster		Problem Solving cluster		Professional cluster	
	Number of behaviors	Significant improvement (%)	Number of behaviors	Sig improvement (%)	Number of behaviors	Sig improvement (%)
London	25	24 (96)	13	13 (100)	20	18 (90)
Queensland	43	25 (58)	9	6 (69)	9	5 (56)
Singapore	24	18 (75)	19[c]	19 (100)	20	18 (90)

[c]5 of these behaviors were included under the Patient Care cluster in the other 2 studies

Figure 1. Changes in Mean Individual Scores by Competency Clusters
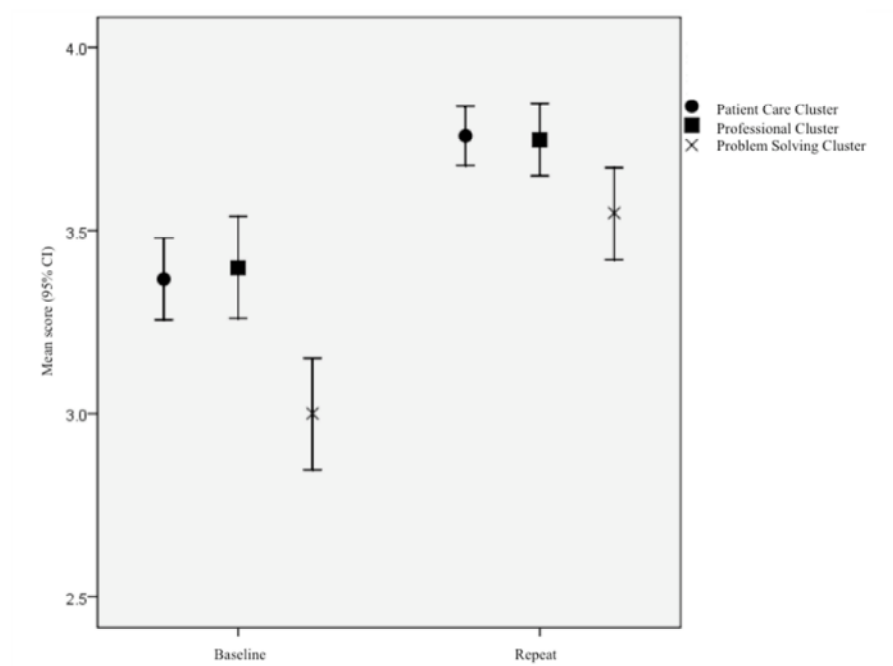
Figure 2. Changes in Mean Individual Scores for Patient Care Competencies
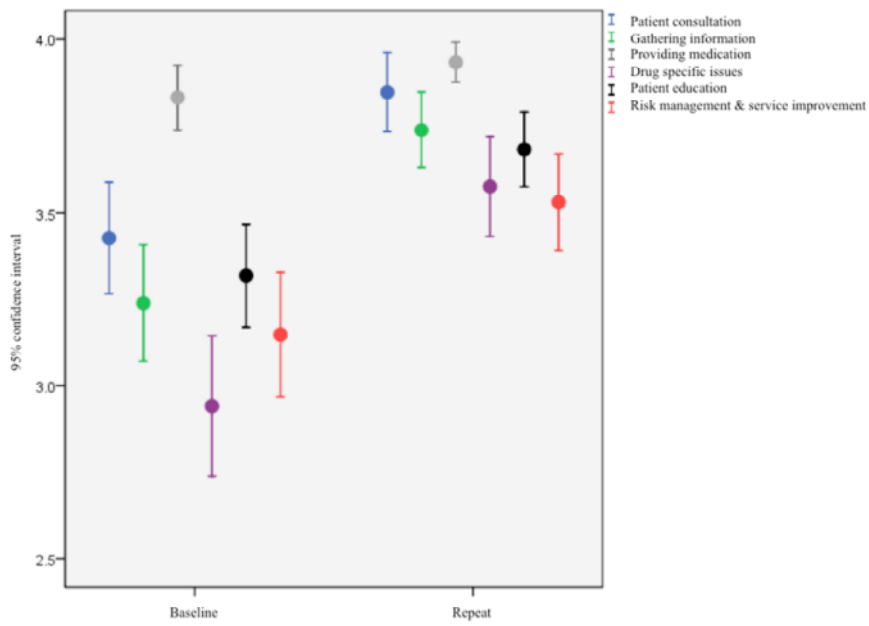

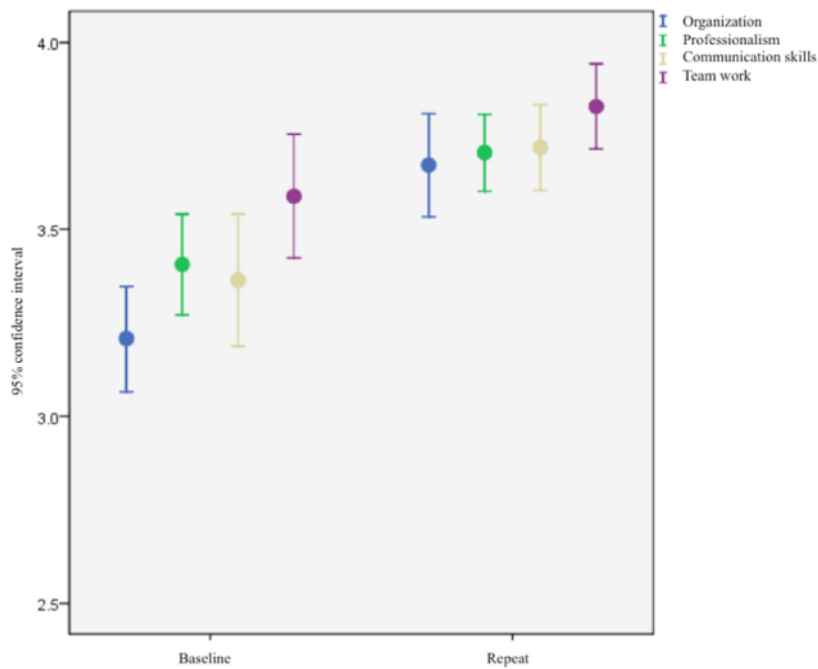Figure 3. Changes in Mean Individual Scores for Problem Solving Competencies

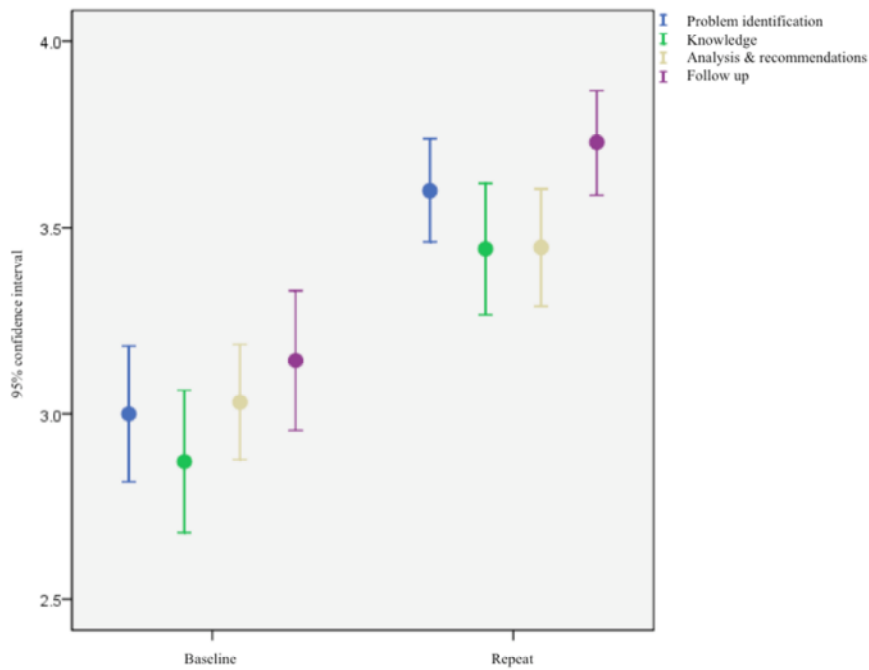Figure 4. Changes in Mean Individual Scores for Professional Competencies

Figure 5. Feedback from Super Trainers Following GLF Evaluation (n=14)