UKM Teaching and Learning Congress 2011

Instrument to assess pharmacists’ perception on application of pharmaceutical chemistry subjects in pharmacy practice


Abstract

Pharmaceutical chemistry is one of the core subjects in the curriculum of Bachelor of Pharmacy program, however, its relevance in the practice of pharmacy in Malaysia has not been reported. Thus, this study is aimed to develop an instrument to evaluate pharmacists’ perception on the application of such knowledge in the community and hospital settings. This survey instrument consist of three sections: (1) demographic information, (2) knowledge of pharmacist in pharmaceutical chemistry, and (3) perception of pharmacist on pharmaceutical chemistry subjects in pharmacy practice that were measured using 5-point Likert scale. Minor amendments were made after the first piloting (group 1, n=10) and then re-tested on another group of pharmacists (group 2, n=10). Cranach’s alpha reliability test value was 0.308 (group 1) for the items measuring the knowledge domain, and 0.766-0.914 (group 1), 0.745-0.889 (group 2) for the items measuring the perception domain. Thus, due to the low reliability value, knowledge domain was removed. The final version of the survey was used to assess pharmacists’ perception on the application of pharmaceutical chemistry knowledge in pharmacy practice.

Keywords: Curriculum; perception; pharmaceutical chemistry; pharmacy; knowledge

1. Introduction

Pharmaceutical chemistry is one of the core subjects in the curriculum of Bachelor of Pharmacy program and is the basic knowledge in pharmacy. Basic science education has been recognised as an important component in a pharmacy curriculum as it provides the fundamental understanding of human diseases and evidence-based drug therapies (Woster, 2003; Skau, 2007).

In Malaysia, the Pharmacy Board has set a minimum quantitative standard for recognition of a pharmacy degree program (Pharmacy Board Malaysia, 2006). The suggested number of minimum credit hours for pharmaceutical
chemistry is 15 and the subjects should include basic organic and inorganic chemistry, medicinal chemistry, pharmaceutical analysis and pharmacognosy. The credit hour is defined as “one credit hour is equal to one hour of lecture/tutorial per week for 14 weeks or three hours of practical classes per week for 14 weeks”. In the Universiti Kebangsaan Malaysia, a total of 26 credit hours of pharmaceutical chemistry subjects are offered in the pharmacy program, whereby 23 credits are obtained from seven specific courses distributed throughout the semesters of the 4-year program (Table 1) and 3 credits are gained from the medicinal chemistry components that are integrated in the various system-based pharmacology courses offered within year two and three. The credit hours are calculated based on notional hours whereby 1 credit hour is equal to 40 student-contact hours per semester based on requirement of the Malaysian Qualifications Framework (Malaysian Qualifications Agency, 2012). The flow of curriculum content for the pharmaceutical chemistry-based courses in UKM is rather similar to that of the pharmacy program offered in the School of Pharmacy, The Chinese University of Hong Kong (Ho et al., 2009).

Table 1. Pharmaceutical chemistry subjects offered in the pharmacy program in the Universiti Kebangsaan Malaysia

<table>
<thead>
<tr>
<th>Year</th>
<th>Pharmaceutical Courses</th>
<th>Chemistry-Based Courses</th>
<th>Credit hours*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semester 1</td>
</tr>
<tr>
<td>1</td>
<td>Pharmaceutical General Chemistry</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Pharmaceutical Organic Chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Medicinal Chemistry</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Pharmaceutical Analysis I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Pharmaceutical Analysis II</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Pharmacognosy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Quality Assurance</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Credit Hours</td>
<td></td>
<td>23</td>
</tr>
</tbody>
</table>

* Calculated based on notional credit hours

The current approach of curriculum design of most pharmacy schools is focused on outcome-based education (OBE) and student-centred learning (SCL), emphasizing on what, why and how students learn (Acharya, 2003) rather than what faculty can do (Kern et al., 1998). In this way, the curriculum is developed based on student learning outcomes encompassing the three learning domains of cognitive (knowledge), psychomotor (skills) and affective (attitude), and not merely using subjects to develop the curriculum master plan (Kern et al., 1998). Student learning outcomes should then help in guiding the content development and determination of teaching and learning instructions (Abate et al., 2003).

In many countries, pharmacy education has advanced towards pharmaceutical care. However, to date, the significance of pharmaceutical chemistry in the pharmacy curriculum and its relevance in the practice of pharmacy in Malaysia has not been reported. Thus, this study is aimed to develop a survey instrument to evaluate pharmacists’ perception on the application of such knowledge in their practice in the community pharmacies and hospitals. The study is hoped to gather feedbacks on the relevance of pharmaceutical chemistry courses from the hospital and community pharmacists. The feedback will be used to improve the UKM pharmacy curriculum so that it is relevant to the current needs.

2. Methodology

The survey instrument was developed based on the previous literature (Clauson et al., 2003). A group consisting of five academicians and five final year students was formed to discuss on the relevant components in the instrument for content validity and minor amendments were made.

The instrument consisted of three sections (I, II and III). The first section had eight open- and close-ended items, and the second section had of four multiple-choice questions. The third section consisted of 20-items statements that measure perceptions using 5-point Likert scale: 5-strongly agree, 4-agree, 3-unsure, 2-disagree and 1-disagree; as well as five open-ended questions. A pilot study was carried out to measure the reliability of the developed questionnaire. The instrument was pretested on 10 pharmacists from the community and hospital settings (group 1). The data was analysed using SPSS 17.0 and Cronbach’s alpha with the acceptable value of more than 0.60 was used to measure the reliability of the items.
Based on the preliminary results, the survey instrument was amended and the revised instrument consisted of only two sections (I and II). The first section had seven open- and close-ended items. The second section had 20-items and five open-ended questions. Another pilot study was conducted on a different group of pharmacists (group 2, n=10). This study was approved by UKM Ethics Committee with the reference number UKM 1.5.3.5/244/NF-036-2011.

3. Results

Section I of the survey consisted of eight items; demographic information, such as gender, age, nationality, ethnicity, education background (2 items), working experience and the area of current pharmacy practice. Section II had four scenario-based questions related to applicability of pharmaceutical chemistry in the practice (Appendix I). Section III consisted of 20 items related to the pharmacist's perception on the relevance of knowledge previously gained from the courses of Pharmaceutical Organic Chemistry (5 items), Medicinal Chemistry (5), Pharmaceutical Analysis (5) and Pharmacognosy (5) in their practice. An example of the items for Pharmaceutical Organic Chemistry course is given in Appendix I. The same items are repeated for the other courses. At the end of every course items, the respondent is asked to provide suggestion(s) on how to improve the course in order to be more applicable in the practice of pharmacy. The reliability results found that, the Cronbach’s alpha value for 4 items in Section II was 0.308, whereas 20 items in Section III had values ranging from 0.766-0.914 and the full results are shown in Table 2.

Table 2. Format of the first survey instrument and reliability statistics for selected items based on a pilot test

<table>
<thead>
<tr>
<th>Sections</th>
<th>N and type of items</th>
<th>Cronbach’s Alpha Group 1 (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Demographic Information</td>
<td>8 OEQ, CEQ</td>
<td>-</td>
</tr>
<tr>
<td>II. Knowledge</td>
<td>4 MCQ</td>
<td>0.308</td>
</tr>
<tr>
<td>III. Perception</td>
<td>A. Pharmaceutical Organic Chemistry 5 LSQ 0.766</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 OEQ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>B. Medicinal Chemistry 5 LSQ 0.909</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 OEQ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>C. Pharmaceutical Chemistry 5 LSQ 0.863</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 OEQ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>D. Pharmacognosy    5 LSQ 0.914</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 OEQ</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>OEQ: open-ended question; CEQ: close-ended question; MCQ: multiple-choice question; LSQ: Likert scale question. (-) Not determined</td>
<td></td>
</tr>
</tbody>
</table>

The second revised and improved survey instrument had only two sections (Table 3), whereby four items from Section II of the first instrument were removed. Section I consisted of demographic information with the nationality item deleted and three items of educational background and working experience made simple. Twenty-item statements in Section II remained the same but the five open-ended questions were modified. The original questions requesting “suggestion(s) towards pharmaceutical analysis course to be more applicable in pharmacy practice” were changed to “suggestion(s) on the teaching and learning methods of pharmaceutical chemistry courses so that the knowledge can be applied in the pharmacy practice of your setting”. The 20 items in Section II of the simplified instrument had reliability values ranging from 0.745-0.889.

Table 3. Format of the second survey instrument and reliability statistics for selected items based on a pilot test

<table>
<thead>
<tr>
<th>Sections</th>
<th>N and type of items</th>
<th>Cronbach’s Alpha Group 2 (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic Information</td>
<td>7 OEQ, CEQ</td>
<td>-</td>
</tr>
<tr>
<td>Perception</td>
<td>A. Pharmaceutical Organic Chemistry 5 LSQ 0.829</td>
<td>-</td>
</tr>
</tbody>
</table>
B. Medicinal Chemistry 5 LSQ 0.889
C. Pharmaceutical Chemistry 5 LSQ 0.772
D. Pharmacognosy 5 LSQ 0.745
5 OEQ -
OEQ: open-ended question; CEQ: close-ended question; LSQ: Likert scale question. (-) Not determined.

4. Discussion

Pharmacists’ perception on application of the pharmaceutical chemistry knowledge in their working practices is important to provide beneficial feedback and information on the significance and relevance of pharmaceutical chemistry subjects within their current practice. These will be used to improve content of our pharmaceutical chemistry courses. Our study is accordant to the principle of backward course design proposed by Daugherty (2006) whereby a curriculum should be designed beginning with identification of the aspired outcomes, followed by determination of the evidence for the outcomes and then plan the learning methodologies.

Initially, we wanted to assess the knowledge of pharmacists whether they understood and could apply their knowledge in pharmaceutical chemistry gained from their undergraduate study. This led us to design a case-based question for section II. The case was selected based on a possible scenario encountered by a pharmacist. The questions were designed to cover assessment of understanding on basic knowledge in pharmaceutical organic chemistry (item number 1), medicinal chemistry (item number 2), pharmaceutical analysis (item number 3) and pharmacognosy (item number 4) related to the scenario. However, most of the surveyed pharmacists seem to be uncomfortable answering the knowledge-based questions as evidenced by the low reliability estimate. This finding is rather similar to several studies that reported lack of confidence in knowledge or perceive inadequacy of knowledge in the area of natural products among community pharmacists (Clauson et al., 2003), as well as in the areas of complementary and alternative medicine (Braun & Cohen, 2007) and dietary supplements (Kwan et al., 2006) among surveyed hospital pharmacists. Thus, our research team decided to remove the knowledge-based questions in the survey.

The 20-items Likert scale questions and 5-item open-ended questions included in the survey are expected to provide valuable data and information for the improvement of four pharmaceutical chemistry courses, particularly pharmaceutical organic chemistry, medicinal chemistry, pharmaceutical analysis and pharmacognosy. Several literatures related to the curriculum advancement of medicinal chemistry (Faruk Khan et al., 2011), pharmaceutical analysis (Albon et al., 2006) and pharmacognosy (Adisa & Fakeye, 2006) are available that can also help in guiding us to revise content of the courses.

5. Conclusion

Reliability analysis of the items developed in a survey is an important process to determine the internal consistency or average correlation of items in a survey instrument to gauge its reliability. The results could determine the items to be used as the survey instrument in improving the pharmaceutical chemistry curriculum in the pharmacy program at Universiti Kebangsaan Malaysia.

Acknowledgements

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References

Appendix I

SECTION II

Mrs J came to your pharmacy with a prescription of ciprofloxacin 250 mg bd (3 days) prescribed for her urinary tract infection. Upon questioning, she is asthmatic and currently taking theophylline 300 mg bd. Prior going to the pharmacy counter, she has purchased Maalox Plus® for her heartburn. The chemical structures of ciprofloxacin and theophylline are shown in Figure 1.

![Chemical structures of ciprofloxacin and theophylline](image_url)

Figure 1. Chemical structures of ciprofloxacin and theophylline

1. Ciprofloxacin has
   A. acidic functional group
   B. basic functional group
   C. acidic and basic functional groups
   D. not sure.

2. Ciprofloxacin may impair performance of skilled tasks such as driving and this is due to the presence of the
   A. benzene ring.
   B. piperazine ring.
   C. cyclopropyl ring.
D. not sure.

3. Infra red spectroscopy is best used to detect the presence of ___________ in theophylline.
   A. carbonyl group.
   B. methyl group.
   C. amine group.
   D. not sure.

4. Theophylline occurs naturally in
   A. ginkgo (Ginkgo biloba).
   B. garlic (Allium sativum).
   C. tea (Camellia sinensis).
   D. not sure.

SECTION III

A. Pharmaceutical Organic Chemistry
   1. Knowledge on pharmaceutical organic chemistry is essential in deciding the most appropriate medication for the patients/consumers.
   2. Knowledge on pharmaceutical organic chemistry is essential in patients/consumers counselling.
   3. Pharmaceutical organic chemistry knowledge is an advantage to a pharmacist compared with the other health care professionals.
   4. I am satisfied with the pharmaceutical organic chemistry knowledge gained from pharmacy degree.
   5. I could apply pharmaceutical organic chemistry knowledge gained from pharmacy degree in my current practice.