



Development of key performance indicators to capture in measuring the impact of pharmacists in caring for patients with epilepsy in primary healthcare: A Delphi consensual study

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ABSTRACT

Objective: This study was conducted to develop and achieve formal consensus on a core set of key performance indicators (KPIs) that can be captured in measuring the impact of pharmacists in caring for patients with epilepsy (PWE) visiting epilepsy clinics as outpatients in primary healthcare practice.

Methods: In this study, a comprehensive literature search and review was conducted to extract candidate KPIs. Interviews with key contacts (6 pharmacists, 2 neurologists, 3 nurses, and 3 PWE) were also conducted to supplement the inventory set of KPI candidates. A three-round Delphi technique was followed among a panel of 40 members to achieve formal consensus on a core list of KPIs. Consensual KPIs were ranked by the ratings of the panelists.

Results: The final consensual core set contained 8 KPIs in the thematic activity areas of pharmaceutical care, medication reconciliation and best possible medication history, patient education/counseling, interprofessional patient care, competence, and performance efficiency/patient satisfaction. The KPIs related to therapy problems identified and resolved by pharmacist and provision of proactive comprehensive direct patient care by a pharmacist received significantly higher (p -value: 0.0001) scores compared to the KPI related to complaints about pharmacists received.

Conclusion: Eight consensual KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice were developed using the Delphi technique. If successfully adopted, implemented, captured, and analyzed, these consensual KPIs might help advance pharmaceutical care of PWE in primary healthcare practice.

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1. Introduction

Globally, epilepsy is one of the most prevalent chronic neurological disorders of the brain that is characterized by unprovoked and recurrent seizures [1]. According to recent estimates, epilepsy affects more than 65 million people around the world with a prevalence rate of about 7.60 per 1000 (95% confidence interval (C.I.): 6.17–9.38) [2–4]. Although the incidence of epilepsy is higher in pediatrics and elderly, patients with epilepsy (PWE) come from all age groups, genders, ethnicities, socioeconomic, and cultural classes. According to the World Health Organization (WHO), approximately 80% of PWE reside in low and middle income countries, of those, approximately 75% do

not receive appropriate healthcare [5]. It has been estimated that the majority (about 70%) of PWE could lead a life free from seizures with appropriate healthcare delivery [6].

Traditionally, epileptologists/neurologists in tertiary healthcare settings or private practice have provided the majority of healthcare services to PWE. Although some PWE see internists, a considerable proportion of pediatric PWE receives healthcare by pediatric neurologists or pediatricians [7]. However, the number of PWE is expected to rise with the increasing incidence of epilepsy, and a shortage of sustainable epileptologists/neurologist based model of care was anticipated [8]. Today, PWE have to wait for an extended period of time before they can see an epileptologist/neurologist. It has been reported that a significant number of PWE do not have a condition complex enough to warrant seeing epileptologists/neurologists [8,9]. Alternatively, primary healthcare-based model to manage PWE has been suggested [7,8,10]. Primary healthcare encompasses providing integrated and accessible healthcare services by healthcare professionals who should be

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accountable to address the majority of patients' health needs, develop a sustainable relationship with their patients, and practice in a context of family or community [11].

Interhealthcare professional models to patient care have been promoted in modern healthcare delivery systems. In these reformed models, pharmacists are fulfilling a wide range of expanding roles and responsibilities. Many professional organizations in the US, Canada, UK, and Australia have advocated the roles of pharmacists in primary healthcare practice [12]. Moreover, new and emerging roles of pharmacists in primary healthcare practice are unfolding with the passage of time. Today, knowledge, skills, and expertise of pharmacists are well-recognized, as a result, pharmacists are among the most trusted and accessible healthcare providers [13]. Pharmacotherapy is a cornerstone in the management of epilepsy. Pharmacists are recognized experts in pharmacotherapy. As healthcare providers, pharmacists assume the responsibility of providing pharmaceutical care. The term pharmaceutical care is related to other terms used in the US and UK as medicines management and medication therapy management services [14]. Pharmaceutical care is defined as providing pharmacotherapeutic services responsibly for the purpose of reaching finite outcomes that directly enhance the quality of life of the patient [15,16]. The philosophy of pharmaceutical care encompasses services offered to patients like taking medication history, counseling, educating, documenting, following up, and collaborating with other healthcare professionals [17]. Previous studies have shown that pharmacists can assume primary healthcare roles in epilepsy clinics in collaboration with other healthcare professionals like physicians and nurses [10,18,19]. Pharmacists provided valuable patient-care services like neurological assessments, mental status assessment, monitored therapeutic drug levels, ordered laboratory tests, screened for and explained side effects and interactions of medications, took medication history, maintained patient records, presented findings to follow neurologists, jointly or independently interviewed patients, followed up with abnormal laboratory findings, detected adverse drug reactions, counseled patients about their medications and disease, educated patients about the best ways to using their medications, and informed patients with dosage adjustments when needed [9,10,19]. Pharmacist interventions have shown to reduce drug-related problems, morbidity, hospitalizations, mortality, optimized allocation of resources, reduced costs, and improved care of patients with chronic neurological disorders including epilepsy, enhanced patients' knowledge of their disease and medications, improved their quality of life, improved their agility in daily activities, and improved their adherence to taking their medications [18]. Previous studies have shown that rapport and trust have been maintained in the relationship between PWE and their caring pharmacists [13,20]. Drug-related problems are common in the management of neurological disorders, particularly, epilepsy. A recent study in neurology unit in a tertiary hospital in Brazil showed that 54.3% the patients sampled encountered at least one drug-related problem that was identified during medication reconciliation at admission, discharge, or during follow-ups [21]. Pharmacists made pharmacotherapeutic interventions to reduce these drug-related problems, of which, the majority (nearly 83%) were accepted.

Lately, modern healthcare delivery approaches have shifted from providing high-volume care to providing high-quality care to patients with chronic diseases including PWE. Therefore, there is a pressing need to measure performance during healthcare delivery. Measurements of processes by which different healthcare delivery or outcomes are achieved by efforts, and activities of healthcare providers have drawn considerable attention [7,22,23]. To this end, the American Academy of Neurology has developed epilepsy quality measures [24]. These proposed

measures focus on different processes across the continuum of epilepsy care. However, these proposed quality measures are not tailored to activities often performed by pharmacists. Caplin et al. developed performance indicators for primary care management of pediatric epilepsy [7]. Again, these indicators focused on activities often performed by physicians.

Key performance indicators (KPIs) are developed to capture performance of processes in delivery of different services including those offered in healthcare. Key performance indicators serve to monitor if healthcare services are delivered consistently and efficiently. Key performance indicators are discrete events that were proven to result in positive outcomes when they occurred for a patient [22,23]. Key performance indicators can inform policy makers, improve quality of care provision, promote accountability to protect patient safety, justify allocation of scarce resources, and help patients make better informed decisions on their healthcare provision [22]. Fernandes et al. developed KPIs for clinical pharmacists providing care to hospitalized patients [23]. Their study led to the development of 8 KPIs that the panelists agreed to use in capturing care activities performed by clinical pharmacists. Brown reported that structured review services provided by a prescribing clinical pharmacist practitioner with a special interest in epilepsy in primary practice in Calderdale had improved care provided to PWE above the indicators of the Quality and Outcomes Framework [10]. The services were advocated as sustainable.

As pharmacists are increasingly integrated in primary care, especially in the management of chronic diseases like epilepsy, there is a need to capture and measure the impact of care services delivered by pharmacists in primary healthcare. Traditionally, physicians and nurses were the only providers of care in primary healthcare practice. Therefore, indicators developed focused on activities performed by physicians and decision makers were left unguided on what activities should be considered in measuring the impact of pharmacists in primary healthcare practice. Currently, the literature narrates little on what activities to capture in measuring the quality of care provided by pharmacists to PWE visiting epilepsy clinics as outpatients in primary healthcare practice. Currently, there is no consensus on KPIs that should be captured in measuring the quality of care provided by pharmacists to PWE visiting epilepsy clinics. To capture the impact of pharmacists in providing care for PWE attending epilepsy clinics in primary care, it becomes indispensable to develop and achieve consensus on what services and activities should be considered as KPIs. This study was conducted to fill this gap in the literature. Therefore, the aim of this study was to develop and achieve consensus on KPIs of healthcare activities delivery by pharmacists to PWE visiting epilepsy clinics as outpatients in primary care practice.

Successful implementation of these consensual KPIs might help identify and measure the significant impact and achievements brought about by integrating pharmacists in epilepsy clinics in primary healthcare practice. These KPIs might also help identify deficiencies that need to be addressed, justify funding, justify allocating scarce resources, and stimulate continuous improvements in healthcare delivery in primary healthcare practice.

2. Methods

2.1. Design of the study

This observational study used the Delphi technique to develop a core set of activities performed by pharmacists that can be used as KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. Iterative Delphi rounds were employed to achieve consensus among a panel of pharmacists and other stakeholders on which activities from an inventory of activities that can be considered as candidate KPIs. The Delphi technique has emerged, since its inception, as one of the most powerful and

Literature search and review

- The literature was extensively searched and reviewed for activities suitable as key performance indicators (KPIs).

Initial inventory of candidate KPIs

- Potentially suitable KPIs were included into an inventory of candidate KPIs.

Piloting

- The questionnaire was piloted by 5 newly graduated pharmacists who did not participate in the subsequent steps of the study.

Interviews with key contacts

- Interviews with key contacts (6 pharmacists, 2 neurologists, 3 nurses, and 3 patients with epilepsy (PWE)).

The study tool

- A questionnaire was designed to collect sociodemographic and practice characteristics of the panelists, their views on the roles that pharmacists can play in caring for PWE in primary healthcare practice, and ratings of the suitability of KPIs in the inventory.

Delphi rounds

- Delphi round 01: 41 potential KPIs were rated as useful by 60% of the 40 panelists.
- Delphi round 02: KPIs were revised and relevant KPIs were combined together to form 12 joint KPIs.
- Delphi round 03: Consensus was achieved on 8 KPIs and the other 4 potential KPIs remained equivocal.

Ranking of consensual KPIs

- The consensual KPIs were ranked by the ratings of the panelists.

Flowchart 1. Flowchart of the Delphi process.

frequently used formal consensus techniques [25]. The technique combines qualitative as well as quantitative approaches in achieving formal consensus among a panel. This technique has gained popularity in developing definitions, concepts, and arriving at consensus on issues that lacked formal expert consensus in healthcare delivery [26–38]. This technique has also enabled systematic refinements of expert opinion in achieving formal consensus on KPIs in healthcare. Formal consensus techniques are often used when the only alternatives are anecdotal and/or subjective approaches. The merits that make the Delphi technique more appealing than other methods that can be used to achieve formal consensus among experts include eliminating geographical obstacles in reaching for and recruiting panelists who possess prior knowledge of the topic being studied, saving financial resources by eliminating the costs of transporting and gathering the experts in one venue for multiple focused groups or roundtable discussions, ease of preventing one or a few panelists to dominate the discussion and impose a generalized bandwagon effect, and efficiency in maintaining anonymity of the panelists [39,40]. In the Delphi technique, panelists can make independent ratings privately of either agreement or disagreement on a series or set of items/statements presented to them. The panelists are often provided with the opportunity to make qualitative comments to justify and/or qualify their ratings. It is quite usual that rounds are repeated iteratively over an extended period of time until consensus is achieved as defined *a priori* [41]. During and after each Delphi round, the feedback process is controlled by the investigator or a steering committee. It is quite usual to provide the panelists with a reminder of their own ratings, summary of the ratings of the other panelists, and summary of the anonymized qualitative

comments made by the panelists on each item/statement [26–28]. The panelists are provided with the opportunity to revise their ratings after reviewing the ratings and comments of other panelists. The panelists are reassured that they could maintain their initial ratings if they wished to do so. They could also provide qualitative comments as rebuttal to the views and comments of other panelists. This practice was shown to reduce the number of iterative Delphi rounds needed to achieve consensus. It is quite often that 2–4 rounds are needed to achieve consensus on issues in healthcare.

2.2. Development of initial inventory set of pharmacist activities that potentially can be used as KPIs

2.2.1. Literature search and review

A comprehensive literature search and review was conducted to identify and extract all activities performed by pharmacists in primary healthcare practice that potentially can be used as KPIs to capture in measuring the quality of care provided by pharmacists to PWE visiting epilepsy clinics as outpatients in primary healthcare practice (Flowchart 1). The databases and search engines: MEDLINE, EMBASE, COCHRANE, CINAHL, SCOPUS, and Google Scholar were searched. In this study, the search strategy used keywords like “pharmacist”, “pharmacy”, “primary”, “health”, “healthcare”, “delivery”, “provision”, “practice”, “general practice”, “epilepsy”, “patients”, “people”, “clinic”, “clinical”, “performance”, “indicators”, “standard”, “benchmark”, “metric”, “system”, “quality”, “evaluation”, “assessment”, and “review”. The keywords were combined using “AND” and “OR” functions. This search strategy was supplemented with manual search within the

references of the scientific papers retrieved. The search was intentionally extended to include other works conducted to develop KPIs for clinical activities performed by pharmacists in hospitalized patient settings. The titles and abstracts of the scientific papers retrieved were screened manually to select papers for full text review. Because the main outcome desired for this literature search was to identify and extract pharmacist activities that can potentially be used as KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice, scientific papers with mention of KPIs, pharmacist, pharmacy, and/or epilepsy in their titles and abstracts received a priority for full text review. Articles were reviewed if they were in English language only. Activities performed by pharmacists found in the scientific papers were extracted [7,10,12,14,18,19,21–24,37,42–61].

2.2.2. Interviews with key contacts to probe for further KPIs

In order to probe for further activities that potentially can be used as KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice that were not mentioned in the literature and to explore the views and opinions of those with long experience in primary healthcare practice and those who provided healthcare for PWE, interviews were conducted with key contacts in the field. The interviewees were 3 pharmacists who provided care for PWE for more than 10 years, 3 pharmacists who worked in primary healthcare practice for more than 5 years, 2 neurologists who often treated PWE, 3 nurses who worked in primary healthcare practice for more than 10 years, and 3 PWE who often visit primary healthcare facilities (Flowchart 1).

The key contacts who were interviewed were asked open-end questions to encourage them to mention important pharmacist activities that can, in their opinion, potentially be used as KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. Activities mentioned by the interviewees were noted.

Activities mentioned by the interviewees and those extracted from the literature were summarized and formulated into brief statements to compose an inventory of pharmacist activities that potentially can be used as KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. The activities in the form of brief statements were reviewed by the key contacts. The objectives of this review step were to: 1) allow the key contacts to “hitchhike” and suggest more activities that potentially can be added to the statements initially formulated, 2) clarify the formulated statements with regard to wording, and 3) refine the activities that potentially can be used as KPIs. Informed by the work of Fernandes et al. and quality parameters of the Agency for Healthcare Research and Quality [22,23], the key contacts agreed that the KPIs ideally need to be: 1) supported by evidence-based practice, 2) linked with a positive impact on patient outcomes in primary healthcare practice, 3) reflective of a role that can be played by pharmacists in primary healthcare practice, 4) attributable to patient care in primary healthcare practice, 5) specific to the pharmaceutical care process, 6) consistent with the professionally set goals, objectives, and practices of pharmacists in primary healthcare practice, 7) acceptable epilepsy-based quality indicator, 8) feasible to quantify or measure, 9) efficient to quantify or measure, 10) a valuable or meaningful quality metric, and 11) generalizable to primary healthcare settings. The key contacts refined the activities based on these criteria. Statements refined constituted the initial inventory set of potential KPIs.

2.3. The tool used in the Delphi rounds

For the Delphi rounds, a questionnaire was formulated that contained 3 sections. The first section was designed to collect the sociodemographic and practice details of the study

participants. In this section, the participants would provide their age, gender, academic qualifications and degrees, profession, employment settings, employer, and approximate number of PWE interacted with per month (educators and those employed by regulatory bodies did not have to answer this question). The second section contained 12 statements on the roles that pharmacists can play in caring for PWE in primary healthcare practice. The participants had to vote by disagree, neutral, or agree to each of these statements. The third section contained the initial inventory set of the brief statements representing pharmacist activities that can potentially be used as KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. The participants had to rate the suitability of using each of the proposed activities as a KPI to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. The study participants were given the opportunity to and encouraged to include qualitative comments to justify and/or qualify their ratings.

2.3.1. Piloting the tool

The study tool was piloted with 5 newly graduated pharmacists who did not participate in the subsequent steps of the study. The aim of this pilot stage was to obtain feedback on the time needed to complete the study tool, clarity of the layout, ease of understanding the instructions, and the statements. Statements that were not easily understood were revised for clarity.

2.3.2. Panel of pharmacists and other professionals with interest in epilepsy

A panel of pharmacists and other professionals (neurologists, pediatricians, internists, primary healthcare physicians, nurses, educators, and decision makers from regulatory bodies) was composed for this study using a judgmental sampling technique (Flowchart 1). Potential panelists were identified, invited, consented, and recruited using personal contacts in the field. As the panelists needed to have prior knowledge of the topic being studied [62], the panelists who were included had prior knowledge of providing healthcare to PWE, the panel included frontline pharmacists, nurses, and physicians from the primary healthcare practice. The key contacts who were interviewed to probe for KPIs were also invited to participate in the Delphi rounds. Although neurologists and epileptologists are usually more frequently consulted by PWE, internists and pediatricians were also represented intentionally in the panel as some PWE often receive healthcare by physicians from these specialties. All panelists had prior knowledge of assessment and evaluative tools used to meter performance of healthcare professionals delivering services. The panel was diversified in terms of age groups, gender, academic qualifications and degrees, hierarchical rank, employer, and profession. The objectives and design of the study were explained to the panelists. Potential panelists were invited based on the following inclusion criteria: 1) possession of an academic qualifications or degrees qualifying for a healthcare profession, 2) having a license to practice one of the healthcare fields directly involved in providing care to PWE (medicine, pharmacy, or nursing), 3) provision of healthcare services to more than 5 PWE per month (educators and regulatory body employees were exempted from this criteria and replaced with involvement in teaching/training students/trainees on issues related to epilepsy), and 4) willingness to participate in the study and provision of consent. Currently, there is no consensus on the number of panelists that needs to be recruited for a Delphi technique. Previous studies used panels in the size of 10 to 1000 [39]. In this study, 40 panelists were included in the panel. The size of the panel was judged to be suitable based on previous studies on which the Delphi technique was used to achieve consensus in issues in healthcare [26–33,35–37,39,40,63–65]. The panelists agreed to take part in the study without any financial incentives.

2.3.2.1. The Delphi round 01. All panelists received and returned the questionnaire in all Delphi round (Flowchart 1). The panelists provided their sociodemographic and practice details in the first section. In the second section, the panelists expressed their views and opinions on the 12 statements related to the roles that can be played by pharmacists in caring for PWE in primary healthcare practice. In the third section, the panelists rated the initial inventory set of activities proposed as potential KPIs to be considered using a 3-point Likert-scale 1–3 (1 indicated that in the panelist's opinion the proposed activity was not useful to be used as a potential KPI, 2 indicated that the panelist was indecisive if the activity was useful to be used as a potential KPI or not, and 3 indicated that in the panelist's opinion the proposed activity was useful to be used as a potential KPI). The objectives of this rating were to: 1) refine the inventory set by selection the most useful activities that potentially can be used as KPIs (the use of a long list of KPIs is neither desired nor practically feasible) and to 2) decide on which activities to carry forward for the subsequent Delphi round. The panelists were given the opportunity and encouraged to provide suggestions and qualitative comments with regard to the wording of the statements, justification and/or qualification of their ratings.

The panelists suggested combining relevant activities together and elaborating of the statements for further clarity.

2.3.2.1.1. Analysis of ratings and comments of round 01. Ratings of the panelists were entered into an Excel Spreadsheet (Microsoft Excel 2013). Percentages of panelists rating each activity as useful were calculated. As it was not possible to use all activities as KPIs, it was decided *a priori* that activities rated as useful by 60% or more of the panelists will be carried forward to the subsequent Delphi round for refinement.

2.3.2.2. The Delphi round 02. Activities that received ratings as useful by 60% and more of the panelists in the Delphi round 01 were carried forward and subjected to a second Delphi round. Informed by the suggestion of the panelists in the Delphi round 01, relevant activities were combined together. In the Delphi round 02, the panelists had to rate each activity using a Likert-scale of 1–9 (1 indicated strong disagreement and 9 indicated strong agreement). The panelists were also provided with the opportunity and encouraged to include qualitative comments to justify/qualify their ratings.

2.3.2.2.1. Definition of consensus in the Delphi round 02. The definition of consensus used in the Delphi round 02 was informed by definitions used in previous studies [28–30,35–37,66]. When panelists rated the activity 1–3, this meant that the panelists were of the opinion that this activity was not suitable to be used as a KPI to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. When the panelists rated a statement 7–9, this meant that the panelists were of the opinion that this activity was suitable to be used as a KPI to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. However, when the panelists rated a statement 4–6, this meant that they were indecisive either to consider this activity as suitable to be used as a KPI to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice or not.

In this study, the definition of consensus was set *a priori* as: 1) when the median score span the range 1–3 and the interquartile range (IQR) was equal to or less than 2, the activity was not considered as a KPI and was removed from the final core set of KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice, 2) when the median score span the range 7–9 and the IQR was equal to or less than 2, the activity was considered as a KPI and was included into the final core set of KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice, and 3) when the median score span the range 4–5 and/or the IQR was more than 2, the activity was considered equivocal. The median scores with their IQRs were calculated using the ratings of all panelists. It

Table 1
Sociodemographic, academic, and practice variables of the panelists (n = 40).

Variable	n	%
Gender		
Male	14	35.0
Female	26	65.0
Age (years)		
<30	12	30.0
>30	28	70.0
Academic degree		
Pharm.D	11	27.5
BSc Pharmacy	8	20.0
BSc Nursing	4	10.0
MSc Pharmacy	6	15.0
MD	4	10.0
PhD	7	17.5
Employment setting		
Primary healthcare	22	55.0
Educational/training organization (university or hospital)	10	25.0
Pharmacy	5	12.5
Regulatory body/ministry	3	7.5
Approximate number of PWE interacted with per month ^a		
10–20	16	53.3
>20	14	46.7

BSc: Bachelor of Science, MD: Doctor of Medicine, MSc: Master of Science, PhD: Doctor of Philosophy.

^a Educators and regulatory body employees did not have to answer this question, number and percentage were calculated based on the number of professionals who answered the question (n = 30).

was decided *a priori* that all equivocal activities in the Delphi round 02 would be subjected to a third Delphi round.

2.3.2.2.2. Analysis of ratings of the Delphi round 02. Ratings of the panelists were entered into an Excel Spreadsheet (Microsoft Excel 2013). The spreadsheet computed the descriptive statistics like the first quartile (Q1), the second quartile (median), the third quartile (Q3), and the IQR for each potential KPI separately. Percentages of panelists rating each activity 7–9 were also calculated.

2.3.2.3. The Delphi round 03. Activities that remained equivocal per consensus definition that was set *a priori* were included into a revised questionnaire (Flowchart 1). The panelists were reminded of their own ratings, the median score with IQR of all ratings of the panelists, and a summary of anonymized qualitative comments made by the panelists on each statement. The panelists were asked if they wished to change or maintain their ratings after considering the ratings and qualitative comments of other panelists. Ratings of the panelists were analyzed using the same definitions used in the Delphi round 02. Based on the qualitative comments provided by the panelists, it was decided that achieving consensus was unlikely in a fourth Delphi round. Therefore, a fourth Delphi round was not conducted.

2.3.2.3.1. Statistical analysis of ratings in the Delphi round 03. Ratings of the panelists on the consensual KPIs were entered into GraphPad Prism for Windows (v.6.0), and data were compared statistically using Dunn's multiple comparisons test. Statistical significance was considered * when the *p*-value was <0.05, ** when the *p*-value was <0.01, *** when the *p*-value was <0.001, and **** when the *p*-value was <0.0001.

2.4. Ethical considerations

The study was conducted in accordance with the ethical principles of An-Najah National University and those in the Declaration of Helsinki. The study received ethical approval from the institutional review board (IRB) of An-Najah National University. The Delphi technique is a semianonymous method in which the identity of the participant is

Table 2
Views and opinions on the roles of pharmacist in caring for PWE in primary healthcare practice.

#	Statement	Disagree		Neutral		Agree	
		n	%	n	%	n	%
1	Pharmacists have the potential to play a key role in caring for PWE visiting epilepsy clinics in primary healthcare practice.	0	0.0	9	22.5	31	77.5
2	Pharmacists' interventions can significantly improve care of PWE visiting epilepsy clinics in primary healthcare practice.	0	0.0	9	22.5	31	77.5
3	Pharmacists' interventions can significantly reduce problems related to AEDs prescribed to PWE visiting epilepsy clinics in primary healthcare practice.	1	2.9	2	5.0	37	92.5
4	Pharmacists should be actively involved in designing pharmacotherapeutic care plans for PWE visiting epilepsy clinics in primary healthcare practice.	1	2.9	6	15.0	33	82.5
5	Pharmacists should assume a key role in reviewing, evaluating, and when necessary recommending changes to pharmacotherapeutic care plans designed for PWE visiting epilepsy clinics in primary healthcare practice.	2	5.7	5	12.5	33	82.5
6	Pharmacists in Palestine are underutilized in caring for PWE in primary healthcare practice.	10	28.6	11	27.5	19	47.5
7	Pharmacists' interventions can improve knowledge of PWE in regard to their AEDs.	1	2.9	1	2.5	38	95.0
8	Pharmacists should be actively involved in educating PWE on their disease and AEDs.	1	2.9	2	5.0	37	92.5
9	Pharmacists should assume a key role in increasing adherence of PWE to taking their AEDs.	0	0.0	3	7.5	37	92.5
10	Pharmacists' interventions can improve adherence of PWE to taking their AEDs.	0	0.0	8	20.0	32	80.0
11	Pharmacists' interventions can improve the quality of life of PWE visiting epilepsy clinics in primary healthcare practice.	1	2.9	9	22.5	30	75.0
12	Pharmacists' interventions can improve abilities of PWE to carry out their daily activities.	1	2.9	9	22.5	30	75.0

known to the investigator while the participant remains anonymous to the rest of the other participants. All authors provided informed consent before taking part in this study. Anonymity of the panelists was maintained during the Delphi rounds. Ratings of the panelists weighed equally in the analysis.

3. Results

3.1. The panel

Responses from all panelists were obtained in all Delphi rounds (the response rate was 100% in all rounds). The panel included participants of both genders, different age groups, with different academic degrees and qualifications, stakeholders, employment settings, and cared for a considerable number of PWE. Of all panelists, 55% were from primary healthcare practice and about 47% interacted with more than 20 PWE per month. The detailed sociodemographic, academic, and practice variables of the panelists are shown in Table 1.

3.2. Views and opinions on the roles of pharmacist in caring for PWE in primary healthcare

When asked to expose their views and opinions on the roles that pharmacists can play in caring for PWE in primary healthcare practice, 77.5% of the panelists agreed that pharmacists have the potential to play a key role and can improve care of PWE through their interventions. The vast majority of the panelists (92.5%) agreed that pharmacists' interventions can significantly reduce problems related to anti-epileptic drugs (AEDs) prescribed to PWE visiting epilepsy clinics in primary healthcare practice. The majority of the panelists were of the opinion that pharmacists in primary healthcare practice should be actively involved in designing pharmacotherapeutic care plans and should review, evaluate, and recommend changes to pharmacotherapeutic care plans. Not surprisingly, only about 29% of the panelists disagreed that pharmacists were underutilized in the Palestinian primary healthcare practice. The vast majority (more than 90%) of the panelists were of the opinion that pharmacists can educate PWE on their disease and AEDs and increase their

Table 3
Consensual KPIs.

#	KPI	Round 02			Round 03			Thematic activity area
		M	IQR	% of panelists voting 7–9	M	IQR	% of panelists voting 7–9	
1	Total number of therapy problems related to AEDs identified and resolved by pharmacist including over- and underdoses, contraindications, allergies, interactions, adverse events, missing AEDs, doses, duplication, ambiguities, incorrect routes of administration, duration of administration, and ineffective therapies.	8.0	4.3	60.0	8.0	2.0	87.5	Pharmaceutical care
2	Number ^a of PWE who received proactive comprehensive direct patient care by a pharmacist working in collaboration with other healthcare professionals	7.0	3.0	62.5	8.0	2.0	82.5	Pharmaceutical care
3	Number ^a of PWE who receive formal documented medication reconciliation by a pharmacist (including a pharmacist best-possible medication history or pharmacist best-possible medication history review as part of the medication reconciliation process as well as resolution of identified discrepancies/problems of their AEDs)	7.0	3.0	52.5	7.0	1.3	75.0	Medication reconciliation and best possible medication history
4	Number ^a of PWE for whom a pharmacist had planned/prepared/completed/executed/implemented a pharmaceutical care plan	7.0	3.3	52.5	7.0	2.0	72.5	Pharmaceutical care
5	Number ^a of PWE who receive documented counseling on AEDs including women of childbearing age by a pharmacist before leaving the clinic	7.0	3.3	60.0	7.0	2.0	72.5	Patient education/counseling/reconciliation
6	Number ^a of PWE who have received documented in-person education from a pharmacist about their epilepsy, comorbidities, and/or AEDs during their visits to the clinic	7.0	3.3	55.0	7.0	2.0	70.0	Patient education/counseling/reconciliation
7	Number of interhealthcare professional discussions on improving care of PWE with active participation of a pharmacist including formal inquiries by healthcare professionals answered by a pharmacist	6.0	4.0	40.0	7.0	2.0	65.0	Inter-professional patient care
8	Number of complaints received about pharmacists/pharmacy per a predefined period of time	5.0	4.0	35.0	7.0	2.0	62.5	Competence and performance efficiency/patient satisfaction

AEDs: antiepileptic drugs, KPI: key performance indicator, M: median, PWE: patients with epilepsy.

^a Or percentage out of total number of PWE who visited the clinic per a predefined period of time.

Table 4
Candidate KPIs that consensus was not achieved on.

#	Candidate KPI	Round 02			Round 03			Thematic activity area
		M	IQR	% of panelists voting 7–9	M	IQR	% of panelists voting 7–9	
1	Number of continuing education attended/delivered by a pharmacist per a predefined period of time	6.0	3.5	47.5	6.0	4.0	50.0	Professional development
2	Number of therapeutic monitoring orders for AEDs ordered by a pharmacist for a justified reason per a predefined period of time	6.0	4.0	47.5	6.5	4.0	42.5	Pharmaceutical care
3	Number of medication errors committed by a pharmacist per a predefined period of time	6.0	4.3	47.5	5.0	4.0	35.0	Competence and performance efficiency
4	Number ^a of PWE with complex and high-risk therapy regimens for whom a pharmacist have documented assessments of the patient's response to treatment plans by following up on defined intervals after the last visit to the clinic (including number ^a of PWE who remained seizure-free)	6.0	5.0	45.0	5.0	3.0	30.0	Pharmaceutical care

AEDs: antiepileptic drugs, KPI: key performance indicator, M: median, PWE: patients with epilepsy.

^a Or percentage out of total number of PWE who visited the clinic per a predefined period of time.

knowledge, and their adherence to taking AEDs. Three-fourth of the panelists agreed that pharmacist interventions can improve the quality of life of PWE and can help them carry out their daily activities. The detailed responses of the panelists are shown in Table 2.

3.3. The Delphi rounds among the panel

3.3.1. Items rated as useful in the Delphi round 01

In the Delphi round 01, 41 items were rated as useful by 60% or more of the panelists. The 41 items are shown in the Supplementary Table 1. The panelists commented that the inventory set was extensively large, and many related activities can be combined together. The panelists suggested forming joint items. Informed by the comments of the panelists, related activities were combined together into 12 items and presented to the panelists for the Delphi round 02.

3.3.2. The consensual core set of KPIs

After combining the activities that were rated as useful by 60% or more of the panelists in the Delphi round 01, a total of 12 potential KPIs were presented to the panelists for rating in the Delphi round 02. As per consensus definition *set a priori* for this round, the median score had to span the range 7–9, and the IQR had to be equal to or less than 2 for the item to be considered as a consensual KPI. As the IQR was more than 2, items were subjected to a third Delphi round. Consensus was achieved on 8 KPIs (66.7%) of the 12 items presented to the panelists. Ratings obtained in the Delphi rounds 02 and 03 are presented in Table 3 ranked by the percentage of the panelists who ranked the item 7–9. Consensual KPIs were from the thematic activity areas: pharmaceutical care, medication reconciliation and best possible medication history, patient education/counseling, interprofessional patient care, competence, and performance efficiency/patient satisfaction.

When the ratings of the panelists were compared using Dunn's multiple comparisons test, ratings of the KPI related to the number of complaints about pharmacists (KPI #8) were significantly lower (p -value: 0.0001) compared with those on the KPI related to the therapy related problems identified and resolved by pharmacists (KPI #1) and those on the KPI related to provision of proactive comprehensive direct patient care (KPI #2) (p -value < 0.001). Ratings of KPI #1 were significantly higher compared with ratings of the KPI #5 (p -value < 0.05). Details of the statistical analysis are shown in the Supplementary Table 2.

3.3.3. Potential KPIs on which consensus was not achieved

Consensus was not achieved on 4 potential KPIs (33.3%) out of the 12 presented to the panelists. The decision to either use these items as KPIs is left to decision makers based on needs that may arise. These 4 potential KPIs belonged to the thematic activity areas: professional

development, pharmaceutical care, competence, and performance efficiency. The detailed ratings of these items in the Delphi rounds 02 and 03 are presented in Table 4.

4. Discussion

In this study, formal consensus was sought for the first time to develop KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. Little guidance on what pharmacist activities can be used as KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics in primary healthcare practice was previously narrated in the literature. In this study, consensus was achieved on 8 KPIs in 5 thematic activity areas that can be used in measuring the impact of pharmacists.

These consensual KPIs might prove useful in supporting improvements to quality care of PWE in primary healthcare practice and advancing evidence-informed pharmaceutical care practice. Key performance indicators might also be helpful in delineating care expectations of PWE visiting epilepsy clinics as outpatients in primary healthcare practice, assist in prioritizing pharmacist activities, describing the standards of pharmaceutical care practice, allowing benchmarking within and between primary healthcare practice settings, promoting professional accountability and transparency, facilitating focus on activities that promote pharmacist contributions in increasing positive patient outcomes, decreasing morbidity and hospital admission of PWE, improving the quality of life of PWE, and helping PWE carry out their daily activities [22,23]. Pharmacists providing healthcare services to PWE visiting epilepsy clinics as outpatients in primary healthcare practice can use these consensual KPIs for self-reflection and identification of improvement venues to advance practice [22]. Capturing and sharing KPIs might also support decision-making in prioritizing tasks, workflow streamlining, and avoiding redundancy. Pharmacists might liaise with other healthcare teams in primary healthcare practice to identify and exploit opportunities for patient counseling, education, and conducting medication reconciliation. Decision-makers may use KPIs to ensure that pharmacists are providing the best care for PWE visiting epilepsy clinics as outpatients in primary healthcare practice within a given budget. Key performance indicator data might also be presented to quality evaluation committees, senior management, and boards of trustees.

In this study, the initial inventory set of activities that potentially can be used as KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice were developed after an extensive literature search and review that was supplemented by interviews with key contacts in the field who were well-versed with pharmacist activities and care of PWE in primary healthcare practice. The decision to interview PWE

was intentional to explore the perspectives of those who are supposed to receive the services. The panelists who took part in all Delphi rounds were of both genders, from different age groups, different geographical locations, had different academic degrees and qualifications, were employed in different settings, and had long experience in caring for PWE. The panel included pharmacists, epileptologists/neurologists, pediatricians, internists, nurses, educators, and decision-makers in regulatory bodies. More than half of the panelists were from primary healthcare practice. This obvious diversity might impart validity and strength to the current study and the KPIs developed might be suitable to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice. Gold standards for developing KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice are not available. When gold standards are not available, professionals, stakeholders, and decision-makers are left unguided on deciding which activities to consider as KPIs. Consensual KPIs developed using formal consensus techniques might provide more appealing and acceptable alternatives when anecdotal and subjective approaches are the only alternatives. It has been argued that professionals are more likely to accept and modify their behaviors in response to KPIs that they agree with in contrast to imposing KPIs that they conflict or do not agree with. To this end, consensual approaches have been promoted to reduce bias, enhance transparency, imparting strength and validity to judgmental methods in developing concepts like KPIs in this study [67].

In this study, the majority of the panelists agreed that pharmacists should assume a greater role in providing care to PWE in primary healthcare practice. Findings of this study were consistent with previous reports advocating the roles of pharmacists in primary healthcare practice [10,12,48,59,68–71].

In this study, consensus was achieved to consider screening for, identifying, and resolving drug-related problems as a KPI to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice (Table 3). Pharmacists are experts in pharmacotherapy and when they are included as members of an interhealthcare professional team, they are expected to screen for, identify, and resolve drug-related problems. Inclusion of pharmacists has shown to identify and resolve drug-related problems in hospitalized patient settings, postdischarge, and in primary healthcare practice [42,43,72]. Not surprisingly, this KPI has been rated at the top of the KPIs by the panelists who participated in this study. Findings of this study were consistent with those reported in recent studies [72,73]. Benson et al. reported that 6 pharmacists identified 1124 drug-related problems during consultations with 493 patients and made 984 recommendations in 15 general practice primary care sites in Western Sydney NSW Australia during a period of 6 months [72]. The study showed that 70% of the recommendations were accepted by physicians and concluded that pharmacists have a vital role to play in identifying and resolving drug-related problems in primary healthcare practice. Another study showed that during a retrospective review of 408 patients posthospital discharge, pharmacists identified 2.5 drug-related problems per patient [74].

Pharmacists are also expected to provide proactive comprehensive direct patient care in collaboration with other healthcare professionals. Providing proactive comprehensive direct patient care might encompass providing a bundle of healthcare activities and not necessarily a single activity. In a previous study by Fernandes et al., a similar KPI was suggested [23]. Medication reconciliation is now a well-recognized pharmaceutical care practice area. In modern healthcare delivery, pharmacists are increasingly involved in taking medication histories, conducting medication reconciliation, and identifying discrepancies/problems and resolving them. Similarly, they are also expected to develop and implement pharmaceutical care plans tailored to the patient's needs [44,46]. Pharmacists are also expected to counsel and educate women, particularly those of childbearing age, on issues

related to women health, epilepsy, and the use of AEDs [37,50,51]. Pharmacists are also expected to assume an educator role in primary healthcare practice. A recent randomized controlled trial has shown that pharmacist implemented educational treatment program improved knowledge and perception of PWE of their disease [47]. Pharmacists are also expected to be active and visible to patients as well as to other healthcare professionals. They are expected to be actively involved in discussions and answer inquiries of other healthcare professionals in the team. Qualitative studies have shown that effective communication was an important barrier to interhealthcare professional care approach [75,76]. Number of complaints received might be used as an indicator of quality of care received or satisfaction with the services [49].

In this study, consensus was not achieved on 4 potential KPIs. These KPIs remained equivocal as per the definition used in this study. Key performance indicators need to be important, relevant, and measurable [49]. Therefore, KPIs might differ with regard to practice settings and patient populations. Probably, not all activities performed by pharmacists are important, relevant, practically, and easily measurable. Therefore, these attributes should be balanced while choosing a suitable set of KPIs.

Recently, informing decision-makers and taxpayers, justifying allocation of scarce resources, securing funding, and demonstrating value of services within business plans have become a priority because authorities are pressurized to take difficult choices to allocate scarce resources, maintain, expand services, and optimize patient care [10,22]. The set of consensual KPIs developed in this study might serve as an invaluable tool for decision-makers and other stakeholders in healthcare.

4.1. Limitations and strength

Findings of the current study might be interpreted taking into consideration the following limitations and strengths. First, the use of consensus technique is a limitation by itself. However, anecdotal and/or subjective approaches are the only alternatives in developing KPIs. Second, epileptologists/neurologists are in the best position to provide care to PWE. A panel composed of epileptologists/neurologists or a higher representation of epileptologists/neurologists in the current panel could have resulted in different findings. However, the panel composed for this study was diversified intentionally to account for the different perspectives of pharmacists, pediatricians, internists, nurses, and stakeholders in regulatory bodies and academia. Third, in the present study, PWE were not included in the panel and did not participate in the ratings during the iterative Delphi rounds. Inclusion of PWE could have yielded different findings. However, the perspectives of PWE could have been accounted for, at least partially, during the interviews that were conducted to supplement the initial inventory set of potential KPIs. Fourth, the panel size used in this study was relatively small. A panel with larger size might have arrived at different consensus. It is noteworthy mentioning that there is no general agreement on the size of a panel for a Delphi study. Previous studies have used panels in the sizes from 10 to 1000 [39]. The panel size used in the present study was in the range of those used in previous studies in which the Delphi technique was used to achieve consensus on issues in healthcare [28, 29,34–39]. Fifth, a purposive sampling technique was employed in recruiting panelists for this study. Nonprobability sampling techniques have long been considered as biased. The use of other probability sampling techniques was not suitable with regard to the nature and objectives of the study. Again, having knowledge of the topic being studied is one of the most important prerequisites for a potential panelist to be included in a panel. Finally, all important activities performed by pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice can be candidate KPIs. Currently, there is no consensus on what activities are more important than others. In many cases, deciding on what activities is important or not can be anecdotal and subjective. However, consensual methods might provide

more appealing and acceptable approaches to inform decision-making on what activities are important to consider as KPIs.

5. Conclusion

In this study, 8 consensual KPIs to capture in measuring the impact of pharmacists in caring for PWE visiting epilepsy clinics as outpatients in primary healthcare practice were developed using the Delphi technique. If successfully adopted, measured, and assessed, these consensual KPIs might help advance pharmaceutical care of PWE in primary healthcare practice.

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Declaration of Competing Interest

None.

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Appendix A. Supplementary data

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