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RESEARCH ARTICLE

Telepharmacy module in clinical pharmacy clerkship: Drug-related problem assessment and student reflections

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Abstract

Background: Telepharmacy services received much attention during the COVID-19 pandemic. These services have proven to be a valuable tool in providing remote patient care and ensuring medication safety. However, there is limited research on assessing drug-related problems (DRPs) and the impact of telepharmacy on student learning and reflection. **Objective:** To characterise the types of DRPs identified and reflect on students' telepharmacy modules during final-year clerkship experiences. **Methods:** In groups of three to five, final-year students conducted 30-minute telepharmacy sessions, documenting patient details and DRPs on data collection forms under supervision. The data were analysed descriptively, and students' reflections were collected via a Google Form survey. **Results:** A total of 187 students completed 48 medication use reviews via telepharmacy. Forty-eight patients were reviewed, and 122 DRPs were identified. The average age was 56 years, and they were taking an average of five medications. The most common types of DRPs reported during telepharmacy sessions were "*non-compliance*" (n=42) and "*adverse drug reactions (ADR)*" (n=30). The main challenges identified by the students throughout the telepharmacy session were unforeseen inquiries and patients with information recall issues. **Conclusion:** Under the guidance of their lecturers, pharmacy students identified a significant number of DRPs through telepharmacy medication use review activities.

Introduction

Pharmacy education has evolved significantly over the years, adapting to the changing landscape of healthcare delivery. One crucial aspect is the integration of telepharmacy, which could provide students with practical experience in technological intricacies and real-world scenarios (Al-Worafi, 2023). This improves students' clinical skills and contributes to patient care and identifying drug-related problems (DRPs) (Petropoulou *et al*., 2005). DRPs encompass all drug-related conditions that potentially impede the achievement of optimal treatment outcomes (Krähenbühl *et al*., 2007). DRPs are common among ambulatory care patients, and if not managed properly, can cause undesirable clinical and economic consequences (Chang *et al*., 2021). Indeed, pharmacists' involvement in patient care has been shown to improve overall process efficiency across a wide range of clinical specialities through medication reconciliation services as it reduces the occurrence and recurrence of DRPs (Francis & Abraham, 2014).

The global pandemic has altered how pharmacists and other healthcare providers interact with patients (Crilly & Kayyali, 2020). In a previous study, the effects of the COVID-19 pandemic on DRPs and pharmacist interventions were evaluated, and it was found that a higher number of DRPs were identified during the pandemic period (Chappe *et al*., 2022). In response to this, numerous state general hospitals and designated

hospitals have decided to offer public telepharmacy services (Nazri *et al*., 2020). It was anticipated that the rapid expansion of telepharmacy use during the COVID-19 pandemic would have long-term implications for access to primary, speciality, and subspecialty care (Smith *et al*., 2020). American Society of Health-System Pharmacists (ASHP) defines telepharmacy as the use of telecommunications technology by pharmacists to monitor pharmacy operations and provide patient care services (Smith *et al*., 2020). Telepharmacy services typically involve medication order review, dispensing, patient consultation and evaluation, therapeutic drug monitoring, and pharmaceutical therapy management (Smith *et al*., 2020). To ensure that pharmacists are prepared for telepharmacy, the exposure must be integrated into their pharmacy training to provide these services in routine or emergency settings (Elnaem *et al*., 2017).

One of the most crucial ways in which pharmacy students acquire the knowledge and skills necessary to administer pharmaceutical care in hospitals and other community settings is through clinical clerkships (Armor *et al*., 2014). Research has demonstrated that pharmacy students' capacity to recognise and resolve DRPs is substantially enhanced when exposed to practical scenarios, opportunities, and experiences involving medication reconciliation, history taking, and medication chart reviews (Armor *et al*., 2014). In preparing future pharmacists for improvement and exposure to adapt healthcare services, various aspects of experiential learning are currently offered in pharmacy schools (Pham, 2009). Graduates would also benefit from understanding the importance of telepharmacy as an emerging standard of care that extends outside the pharmacy field (Smith and Benedict, 2015; Cole *et al*., 2019).

Telehealth-related activities have been demonstrated to improve student learning in both medical and nursing programs (Smith *et al*., 2020). Nevertheless, there is a paucity of data regarding training strategies for telepharmacy and the ability of pharmacy students to identify DRPs via telepharmacy. Thus, this study aims to i.) characterise the types of DRP identified by the students during the telepharmacy sessions and ii) gather student's reflections on their final-year clerkship experiences regarding the telepharmacy module.

Methods

Description of course

Clinical pharmacy clerkships (CPC) constitute a mandatory preparatory training requirement for fourth-year bachelor of pharmacy students in Universiti Teknologi MARA (UiTM), Malaysia. As one of the components of the CPC, these students were required to participate in the telepharmacy module, which spanned one week. There were 187 final-year students, divided into small groups consisting of three to five students making up for 48 groups. The telepharmacy module was conducted in June 2022. The activities included a webinar, sessions of medication use review and documentation via telepharmacy, case presentation with pharmacist lecturers, documentation and a reflection survey (Figure 1).

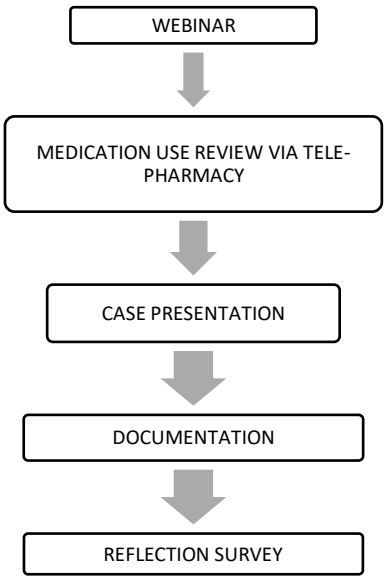

Figure 1: The flowchart of the telepharmacy module

Telepharmacy-based patient interview and identification of potential DRPs

Webinar

The online webinar was conducted by Rhazes Consultancy Services, a digital health technology service provider that connects the public with consultants, specialists and subject matter experts in telepharmacy. The webinar aimed to guide the students on how to conduct a medication use review and counselling via telepharmacy. The webinar was conducted for eight hours, providing comprehensive coverage of the ethical and regulatory aspects related to telepharmacy.

Medication use review

The medication use reviews via telepharmacy were conducted at the Faculty of Pharmacy, UiTM. A data collection form was provided to students to record patient information and lists of medications taken

during the interview activities (Appendix A). An estimated 20 to 30 minutes were spent on each telepharmacy-based medication use review session. Convenience sampling was applied in this study. The patients involved were recruited from the students' pool of relatives and friends aged more than 18 years old and had at least two chronic diseases, such as diabetes, hypertension, cholesterol, asthma, and others. The incorporation of patients identified through the student's network aimed to enhance the efficacy of communication channels. Each telepharmacy session was supervised by pharmacist lecturers from the Department of Clinical Pharmacy, Faculty of Pharmacy, UiTM, who have an interest and expertise in research and teaching of telepharmacy. The activities were carried out per the time and platform preferences of the patients, which included options such as phone calls, online platforms, or WhatsApp video calls. Verbal consent from each patient was obtained before the telepharmacy sessions. The patient's participation was voluntary, and no remuneration was provided.

Case presentation

Following the telepharmacy session, the student presented cases to the class, ensuring patient identities were anonymised to maintain confidentiality. During telepharmacy-based interviews, DRPs were identified in indication, effectiveness, and safety by comparing drug therapy choices and dosages against clinical practice guidelines (CPGs). Compliance was evaluated using specific questions, such as, "*Do you ever forget to take your medication as instructed?*" A correctly stated DRP includes 1) a description of the patient's condition or problem, 2) the drug therapy involved, and 3) the specific association between the drug therapy and the patient's condition (Cipolle *et al*., 2012).

Furthermore, the identified DRPs and interventions were meticulously presented and thoroughly discussed in a dedicated case discussion session facilitated by the respective lecturers. This session was a pivotal opportunity to delve into the nuanced complexities of each identified issue, fostering in-depth exploration and analysis. The case presentations aimed to refine students' critical thinking and problem-solving skills within the realm of pharmaceutical care.

Documentation

The findings of the medication use review session were documented in the data collection form. Following this, a detailed report including demographic information, medication history, identification and justification of DRP, treatment plan and follow-up plan was mandatory for submission to the supervising lecturer. Then, the identified DRPs underwent descriptive analysis for frequency using an Excel spreadsheet. Firstly, the frequency of each category of DRPs, including indication, effectiveness, safety and compliance, was calculated. This involved tabulating the total number and proportion of DRPs within each category. Additionally, subcategories within each main category were analysed to identify prevalent patterns or trends. For instance, within the indication, unnecessary drug therapy and the need for additional therapies were quantified. Similarly, within the safety category, the frequencies of ADRs and too-high dosages were documented. Lastly, within the effectiveness category, the amount of ineffective drug therapy and dosage too low was also calculated.

Student opinions and reflection on the telepharmacy module

Survey

An anonymous survey was conducted after completing the telepharmacy module to gather the students' opinions and reflections. The survey, administered via Google Forms, comprised seven open-ended questions. Thematic analysis was utilised to discern overarching themes and subthemes. The researchers independently analysed the data via NVivo 19 to code a subset of the data and then compared their coding results to ensure the consistency of the data. Discrepancies were discussed and resolved through consensus. The significant illustrative quotes were extracted from the responses, which were subsequently organised in Table I.

Ethical approval

Before commencing this research, approval was obtained from the Universiti Teknologi MARA Research Ethics Committee REC/08/2022 (ST/MR/175)

Results

Telepharmacy-based patient interview and identification of potential DRPs (quantitative data)

A collective of 48 patients engaged in telepharmacy-based medication usage review activities. The participants' ages ranged from 23 to 79 years old, with an average age of 56 years. On average, the patients had a minimum of two chronic ailments and were taking five medications.

The results of this study indicate that pharmacy students could identify an average of 2.67 drug-related problems (DRPs) per patient. The maximum number of drug-related problems (DRPs) detected was six, while

the minimum number was zero. Figure 2 demonstrates that non-compliance issues (n = 42) were the most common categories of DRPs identified via telepharmacy sessions. These were followed by adverse drug reactions (n = 30), needing additional therapy (n = 14), dosage too high (n = 13), unnecessary drug therapy (n = 11), and needing a different drug product (n = 6) and dosage too low (n = 6).

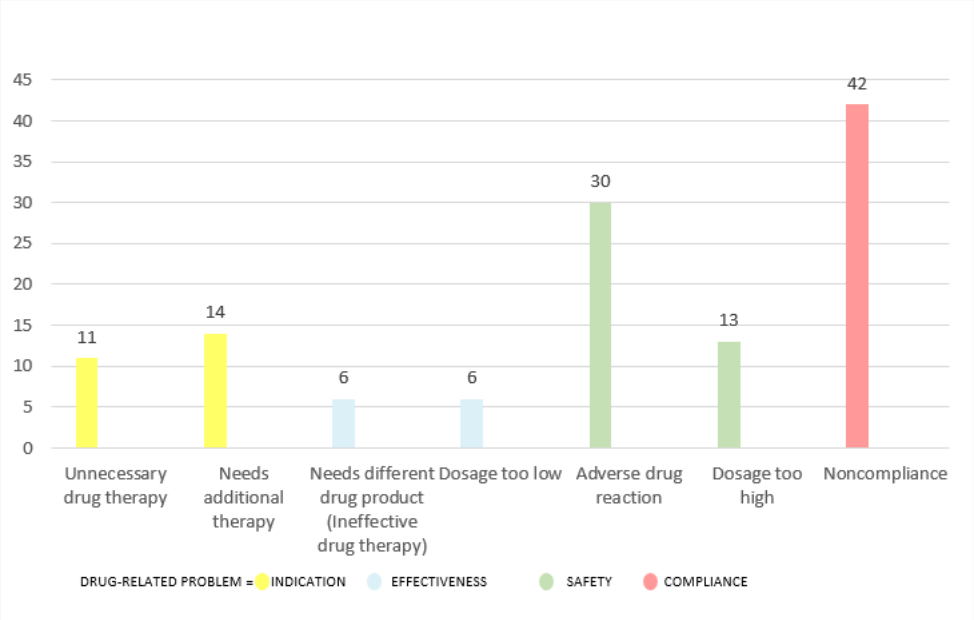

Figure 2: Categories of the DRP

Student opinions and reflection on the telepharmacy module

A total of 183 students' reflections were collected at the end of the telepharmacy module. The analysis revealed six themes and 13 subthemes, with corresponding illustrative quotes, providing valuable insights into the students' opinions and reflections (Table I).

Table I: Student opinions and reflection on the telepharmacy module

Theme	Subtheme	Illustrative quote
Prior knowledge of telepharmacy	Fundamentals of telepharmacy	*"Just the basic idea of what telepharmacy is. I know that telepharmacy provides medication counselling services through an online platform." (RQ)*
	Limitations in knowledge beyond lecture content	*"Not much other than what I had learned during the lecture."(AJ)*
Experiential learning of telepharmacy	Educational benefits of virtual training	*"I enjoyed learning the exact procedure and how to be involved in a virtual counselling session."(IL)*
	Real-world experience through interview sessions	*"I like interview sessions with real patients since it feels like a real scenario in a hospital setting."(NZ)*
Knowledge attained from telepharmacy	Effective patient interviewing and counselling techniques	*"The technique on how to interview a patient using open-ended questions and medication use review through an online platform."(NZ)*
	Patient criteria in telepharmacy	*"I learn what type of patients can be recruited for medication use review (via telepharmacy)."(IL)*
	Enhancing confidence and communication skills	*"We get to communicate with patients without being nervous. I feel less nervous maybe because I am not meeting them face to face. I think this opportunity is good for me to explore more in the future."(MI)*
Challenges experienced in the telepharmacy	Challenges in patients with dementia	*"Our patient has dementia, and it was quite hard to communicate. The information we got might be inaccurate" (NA)*
	Addressing unforeseen patient inquiries	*"I (received) an unexpected question from the patient about rumours on lemon and uric acid management about his gout condition" (NN)*

Theme	Subtheme	Illustrative quote
Strategies for addressing and overcoming challenges in telepharmacy	Involving caretakers in healthcare decision-making	*''Our patient has dementia. Hence, we decided to communicate with the caretaker instead. ''(MQ)*
	Seeking guidance and ensuring patient safety in uncertain situations	*''In any uncertain situation such as to advise a patient, I will immediately seek clarification with my lecturer to answer it because I do not want to give the wrong answer to the patient.''(NUJ)*
Prospects	Strengthening counselling skills for professional practice	*''I can improve my skill in counselling patients and practice for upcoming Objective Structured Clinical Examination (OSCE), and during Provisional Register Pharmacist (PRP) in the future.''(SM)*
	Telepharmacy as a future career option	*''Considering telepharmacy as one of the options for me in the future to pursue, improve my counselling techniques and knowledge.'' (AL)*

Discussion

This study investigated the range and classification of drug-related problems (DRPs) identified via telepharmacy practices. Pharmacy students observed 122 DRPs, which were organized into four primary categories: indication, effectiveness, safety, and compliance. It was noted that, on average, each patient had 2.67 DRPs.

The study found that the most common DRPs during telepharmacy consultations were non-compliance, with 42 instances, and ADRs, with 30 cases. These findings are in line with a similar study in the United States, which involved 76 patients in transitional care and highlighted non-compliance and ADRs as significant DRPs when pharmacists are part of telehealth services (Azon *et al*., 2019; Lam *et al*., 2011). Additional research on telehealth interactions with pharmacists also indicates that a significant proportion of patients (about 70%) addressed compliance-related issues (Ibrahim *et al*., 2019). In contrast, another study focusing on pharmacy students identified incorrect medication, quantity, and dosage strength as frequent ADRs in telepharmacy practices (Elnaem *et al*., 2019).

The variation in the types of DRPs identified might be due to differences in patient data, clinical scenarios, and the specific criteria used for categorising DRPs. Additionally, the classification systems for DRPs may vary across different healthcare settings, contributing to the observed discrepancies. While some institutions follow standardised systems like the Pharmaceutical Care Network Europe (PCNE) classification, others might use their tailored systems (Schindler *et al*., 2021). This variation in classification approaches can lead to differences in how DRPs are identified, categorised, and reported, suggesting a need for more standardised methods to ensure consistency in the management and reporting of DRPs in telepharmacy practices (Schindler *et al*., 2021).

This study observed an average of 2.67 DRPs per patient, a figure aligning with DRP frequencies identified by pharmacy students during clinical clerkships in Malaysia and Sweden (Elnaem *et al*., 2019; Schindler *et al*., 2021). Nonetheless, this average is notably higher compared to the findings from another study involving 300 patient cases in India, where the average DRP rate was 1.29 per patient in internal wards (Mohammed *et al*., 2017). Additionally, research focusing on 103 elderly patients in medical wards of a hospital in Northern Sweden reported an average of 1.53 DRPs per patient, identified by pharmacists (Peterson & Gustafsson, 2017). Such disparities in findings suggest that the prevalence and nature of DRPs can vary significantly depending on the healthcare setting. This variation might reflect differences in the expertise and knowledge level of the clinical or student pharmacists conducting medication use reviews via telepharmacy (Armor *et al*., 2014).

The telepharmacy module was well-received by most students, who valued it for its comprehensive insights into the requisite techniques and skills for proficient telepharmacy practice. This study emphasises the critical importance of telepharmacy-based training in clinical clerkships, highlighting that while traditional lectures lay a crucial theoretical foundation, hands-on experiences are indispensable for cultivating competent theoretical knowledge with practical application in pharmacy education (Epstein & Hundert, 2002). This perspective is in line with established educational paradigms that champion the significance of experiential learning and a patient-centric approach to care (Ford *et al*., 2004).

The opportunity to engage directly with actual patients via the telepharmacy module was particularly appreciated by most students, as it honed their problem-solving abilities and communication skills. This underscores the value of telepharmacy modules in equipping students with practical experience, thereby facilitating a seamless integration of theoretical learning with real-world application. Moreover, previous research supports the notion that experiential learning, characterised by active involvement with tangible challenges, significantly enhances the

students' capacity to employ their academic insights effectively in practical settings (Dewey, 1986).

However, this study had various challenges faced by students in telepharmacy sessions, underscoring the need for targeted improvements in both the telepharmacy module's structure and the broader integration of telepharmacy within the healthcare system. Notably, managing patients with dementia poses a significant challenge, as these patients often struggle to provide precise information about their medication and symptoms. Effective management of such cases necessitates strategic engagement with caregivers and a nuanced approach, as the complexities involved in dementia care, which were well-documented by Prince and colleagues in 2016, were also pertinent to the realm of telepharmacy.

Additionally, telepharmacy sessions frequently present scenarios where patients pose unexpected questions, demanding quick and adaptable responses from pharmacists or students. These inquiries may span various aspects, from medication specifics and treatment regimens to broader health concerns. Delivering effective patient-centred care, in line with the principles espoused by prior studies, hinges on the ability to address these queries with precision, empathy, and clarity (Mead & Bower, 2000). This accentuates the need for continuous training and mentorship for telepharmacy professionals, equipping them to adeptly navigate and respond to unanticipated patient interactions (Wass *et al*., 2001). While telepharmacy introduces several benefits to healthcare delivery, it's imperative to recognise and proactively manage the inherent challenges encountered during telepharmacy consultations to optimise the utility and effectiveness of this modality.

Furthermore, the findings of this study highlight the profound impact of telepharmacy on pharmacy students' knowledge, practical skills, and prospects for their future careers. Engaging in telepharmacy enables pharmacy students to refine crucial practical abilities such as patient communication, medication consultation, and problem-solving. These competencies, sharpened within real-life contexts, are instrumental in enhancing student performance in Objective Structured Clinical Examinations (OSCEs), which Wass and colleagues in 2001 acknowledged as a pivotal measure for appraising clinical competence in pharmacy education.

The hands-on experience garnered through medication use review via telepharmacy is invaluable in preparing students for the intricacies of OSCEs, which are designed to replicate actual patient interactions (El Hajj *et al*., 2014). Moreover, the telepharmacy module offers an exceptional preparatory ground for students poised to assume roles as Provisional Register Pharmacists (PRPs) or interns. The practical exposure to medication counselling, patient evaluation, and adherence monitoring during telepharmacy sessions is closely aligned with the duties shouldered by PRPs in diverse healthcare environments.

In Malaysia, PRP training is a mandatory prerequisite for pharmacists before their formal registration with the Pharmacy Board. El Hajj and colleagues (2014) also pointed out that transitioning from pharmacy school to professional practice can pose significant challenges. However, the telepharmacy module endows students with the experiential knowledge essential for a seamless transition into their professional careers. Moreover, participation in the telepharmacy module may spark an interest in pursuing telepharmacy as a career path among students to broaden the horizons of pharmacy practice. As the field of telepharmacy continues to evolve and expand within healthcare delivery, students with telepharmacy experience are uniquely poised to make meaningful contributions to this dynamic sector (Taylor *et al*., 2018). In essence, the practical insights and skills acquired through the telepharmacy module hold extensive implications for pharmacy students, not only bolstering their current academic journey but also paving the way for their future professional endeavours in the ever-evolving landscape of pharmacy practice.

This research demonstrates notable strengths, particularly in the pharmacy curriculum. Amidst the increasing volume of research surrounding telepharmacy in response to the COVID-19 pandemic, this study uniquely focuses on assessing the competencies of pharmacy students. It sheds light on the proficiency of pharmacy students in identifying DRPs through telepharmacy modalities. However, it's important to acknowledge certain limitations. The patient sample, primarily comprising students' relatives and family members, introduces potential biases in information acknowledgement and comprehension. Additionally, the medication use review activities, conducted only once, yield a limited set of datasets for the students' analysis. Future research expanding the patient sample and analysing the patient's demographic may provide a more representative view of pharmacy students' abilities in identifying DRPs through telepharmacy. Additionally, the results of this study can further allow future research to delve into the development of standardised protocols for telepharmacy education within pharmacy curricula. Investigating the effectiveness of different educational approaches could contribute to optimising pharmacy education around healthcare delivery.

Conclusion

This research underscores the considerable value of integrating telepharmacy into the educational curriculum for pharmacy students, particularly in enhancing their proficiency in identifying DRPs through telepharmacy sessions. The study's outcomes indicate that, under appropriate mentorship, pharmacy students can identify an average of 2.67 DRPs per patient, with compliance issues and adverse ADRs emerging as the most prevalent types. Participating students' reflections also shed light on the telepharmacy module's beneficial impact in refining their communication and medication history-taking competencies. The collective insights from this study advocate for the incorporation of telepharmacy training within pharmacy education, highlighting its instrumental role in providing students with real-world experience and preparing them with the vital skills necessary for their prospective roles in the pharmacy profession.

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Conflict of interest

The authors declare no conflict of interest.

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Appendix A: Documentation for clerking cases by conducting medication use reviews via the Tele-pharmacy module

1. Introduction guide

- Explain the purpose of the medication review and the benefit for the patient, this will establish a trust to ensure complete medication history and disclosure of compliance
- Does the patient understand how to take the medication and any special precautions?
- Check that written patient medicine information has been provided (where available)
- Check comprehension and literacy regarding labelling, consumer medicines information
- Consider appropriate aids for compliance, equipment for administration or monitoring
- Referral to a pharmacist may assist, and also check the use and maintenance of equipment such as nebulizers, spacers, peak flow meters, and blood glucose level meter.

2. Quick checklist for a medication review

- Gain consent and cooperation of the patient, explain what you hope to achieve
- Take an accurate and complete medication history, preferably sighting all medications
- Complete the medication review form (provided) with the patient
- Clarify the treatment goal for each medication e.g. reduction of blood pressure to target level
- Identify potential problems and assess clinical relevance
- Follow up on actions and continue to monitor.

A. Taking A Medication History

Use a non-judgmental technique and open-ended questions.

- Ask about: all prescription drugs, prescribed by you (pharmacists) and other doctors over the counter (non-prescription) medications complementary (herbal, alternative, vitamin) products eye drops, inhalers, patches, and topical treatments. The status of smoking, alcohol, and pregnancy are being reviewed, and any usage of illicit drugs will be recorded as well.

- Record all adverse drug events, for example: allergic reactions, adverse reactions and other possible related events, such as falls in the documents below.

- Discard any out-of-date medications or repeat prescriptions for drugs that are no longer needed.

Demographic data

Parameters	**Factors**	
Name:	Age: Gender	Height/Weight
History of present illness		
Past Medication History		
	List of supplements (if any): 1. 2.	
Past Medical History		
Social/ Family History	Smoking Alcohol Drug Abuse Pregnant	
Allergies	No ☐ Yes ☐ If yes, please state the name of the medication ……..	

Medication use review

For example, name, frequency, method, and reason (indication) for use.

- Ask patients regarding the medication details i.e., generic name and brand name, and strength of the medication.
- Ask patients about the prescribed dose and frequency of the medication
- Ask patients about the actual dose/ frequency of the medication taken and method of use
- Ask patients about the indication of the medication
- Ask the patient about the storage condition of the medication

Table II: The patient medication history

Medication history				
Medication (generic/ brand name and strength)	Prescribed dose/ frequency	Actual dose/ frequency/ method of use	Treatment goal (reason for medication)	Storage condition

Medication/ drug-related problem identification

- Identify and list any drug-related problems in this patient:
- The aim is to solve or avoid any medication-related problem/s that interfere with the desired
- patient outcome. Some problems may require further investigation.
- Are there any untreated indications?

Is this the most appropriate drug for the indication(s)?

- Is the drug effective and is the treatment goal being achieved?
- Have there been changes in evidence/best practice since it was first prescribed?
- Have appropriate non-drug measures been instituted?
- Is there an ongoing need for this drug?
- Have any drugs been initiated to treat adverse drug effects?
- Is the dose, frequency and formulation appropriate?
- Has the dose been individualised for the patient? Consider weight, age, renal function, etc.
- Is there duplication?
- Drugs in the same therapeutic class, generic-brand duplication
- Does the patient have contraindications to any medications?
- Consider disease states, pregnancy, renal function, liver function, drug allergies etc and consider therapeutic alternatives
- Are there any actual or potential adverse effects occurring?
- Are there any clinically important interactions (drug-drug, drug-food)?
- Is the drug effect and/or side effects monitored appropriately?
- Are there any problems with compliance/concordance?

Drug-related problem	Justification

Drug-related needs	Categories of drug-related problems	Sub-categories of drug-related problems
Indication	Unnecessary drug therapy	No medical indication
		Duplicate therapy
		Nondrug therapy indicated
		Treating avoidable ADR
	Needs additional therapy	Untreated condition
		Preventative/prophylactic
		Synergistic/potentiating
Effectiveness	Needs different drug product (Ineffective drug therapy)	More effective drugs are available
		Condition refractory to drug
		The dosage form is inappropriate
		Not effective for the condition
	Dosage too low	Wrong dose
		Frequency inappropriate
		Drug interaction
		Duration inappropriate
Safety	Adverse drug reaction	Undesirable effect
		Unsafe drug for the patient
		Drug interaction
		Dosage administered or changed too rapidly
		Allergic reaction
		Contraindications present
	Dosage too high	Wrong dose
		Frequency inappropriate
		Duration inappropriate
		Drug interaction
		Incorrect administration
Compliance	Noncompliance	Directions not understood
		Patient prefers not to take
		Patient forgets to take
		Cannot swallow/administer
		Drug product not available