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Pharmacy practice in hospital settings in GCC countries: Prescribing and transcribing

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ABSTRACT

Purpose: To outline hospital pharmacy practices across the Gulf Cooperation Councils (GCC) countries' hospitals.**Methods:** A modified survey questionnaire was prepared from the original 2019 American Society of Health-System Pharmacist (ASHP) survey questions. Survey details were discussed with some pharmacy directors for clarity and relevance. A list of hospitals were obtained from the Ministry of Health of each of the targeted GCC countries. A secure invitation link containing a survey questionnaire was sent to the participants directly.**Results:** Sixty four hospitals responded to this survey. The overall response rate was 52%. About 47% of the surveyed hospitals considered their drug formularies as closed, and strict. Additionally, only 44% of hospitals compare the effectiveness of products, when taking formulary decisions for drug inclusion. Forty-four percent of hospitals have computerized prescriber order entry (CPOE / EHR) system functionality for formulary system management. At about 39.1% hospitals, pharmacists have the responsibility for managing medication therapies, majority were engaged in providing anticoagulation therapies. About 61% of hospital pharmacies in GCC countries receive medication orders electronically, through CPOE/EHR. Majority (66%) of the hospitals in GCC countries have an active Antimicrobial Stewardship Program (ASP) while only 40% of pharmacists have a key role in providing clinical support. About 57.8% of hospital pharmacy directors reported that pharmacists do not provide ambulatory care clinical pharmacy services in their hospitals.**Conclusion:** In GCC countries' hospitals, there are major areas for improvement to patient care of which pharmacists are uniquely qualified as the medication experts to have the most meaningful outcomes in all of the domains of safe medication use, medication therapy management, antimicrobial stewardship program and participation in outpatient clinics.© 2021 The Authors. Published by Elsevier B.V. on behalf of King Saud University. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Abbreviations: GCC, Gulf Cooperation Councils; ASHP, American Society of Health-System Pharmacist; SPS, Saudi Pharmaceutical Society; CPOE, Computerized prescriber order entry; HER, Electronic health record; P&T, Pharmacy and therapeutics committee; FMEA, Failure mode and effects analysis; LMWHs, Low molecular-weight heparins; DOACs, Direct oral anticoagulants; ASP, Antimicrobial stewardship program; MTM, Medication Therapy Management.

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1. Introduction

The pharmacy profession witnessed evolutionary changes over the past three decades (Abousheishaa et al., 2020). The pharmacist's role has shifted significantly from a primarily dispensing function to more direct patient care through providing comprehensive medication management to patients (Mansur, 2016). Furthermore, the hospital pharmacy services across countries ranged from traditional drug-centered pharmacy practice to a more progressive, clinically-oriented practice (Abousheishaa et al., 2020). There are six components of the medication use system: prescribing, tran-

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scribing, dispensing, administration, monitoring, and patient education. The pharmacists play an important role in these processes to assure the safe and effective use of drugs. Pharmacists ensure that their patients receive correct medications and doses and educate them how to use the medication safely and effectively.

Our survey focused on the first two components, namely the prescribing and transcribing process. It includes prescribing drugs by physicians; and transcribing or reviewing them by pharmacists. These processes meant to protect patients and minimize human and technology error to avoid costly adverse events, but aforesaid processes are complex and can be pervaded by quality deviations and failures, resulting in medication errors at any stage (Hughes and Blegen, 2008; Vogenberg and Benjamin, 2011). Therefore, to improve the promotion of safe drugs handling, it is necessary to ensure each of these processes' quality.

Several studies have undertaken surveys to assess current hospital pharmacy practices in their country or region to understand the pharmacy practice culture across different health care systems (Doloresco and Vermeulen, 2009; Alsultan et al., 2012a; Alsultan et al., 2012b; Alsultan et al., 2013; Pedersen et al., 2017; Schneider et al., 2018; Lemay et al., 2019; Pedersen et al., 2019; Altyar et al., 2020; Pedersen et al., 2020). These surveys assessed practices at different times and guided strategic initiatives. Henceforth, in 2012, a project was designed in collaboration between the faculty of King Saud University College of Pharmacy, the Saudi Pharmaceutical Society (SPS) and the American Society of Health-System Pharmacist (ASHP). We had undertaken the proposal to assess the hospital pharmacy practice prevalent in Saudi Arabia. The current project is a follow-up of a 2012 project to survey the current state of hospital pharmacy practice in the Gulf Cooperation Councils (GCC) countries. The survey's general purpose was to outline pharmacy services in GCC countries' hospitals and obtain information on a wide range of important areas, especially the medication use process's safety and quality.

The survey explored the quality of the first two steps of the medication use process, i.e. prescribing and transcribing in hospitals in GCC countries.

2. Methods

To evaluate prescribing and transcribing practice in GCC countries, we prepared a modified survey questionnaire from the original 2019 ASHP survey questions in consultation with ASHP survey members (Pedersen et al., 2020). Prior to finalization and distribution, we validated the questionnaire using the following approaches; (1) A research team in our group reviewed the questionnaire and provided feedback. Then, the content of the questionnaire was revised or eliminated accordingly (2) We discussed the survey details for clarity and relevance with some pharmacy directors and sought their opinion and input in developing and improving the items to ensure that we measured what we intended to measure.

Three major domains of questions for general characteristics and first two steps of the medication use process, i.e. prescribing and transcribing in hospitals in GCC (Saudi Arabia, Kuwait, UAE, Oman and Bahrain) were identified. (1) The process of drug formulary strategies used by the hospital pharmacy and therapeutics (P&T) committee, computerized prescriber order entry, and/or electronic health record (CPOE and or EHR) functionality for formulary system management and types. (2) Pharmacists' responsibility for managing medication therapies, the value of pharmacists' intervention services, auto-verification functionality, transitions of care processes, and technology used while providing patient care. (3) Pharmacists' involvement in ambulatory care, primary care

clinics, antibiotic stewardship programs, and the technology used during sterile product preparation. Data collection was performed using a convenience sampling technique. Convenience sampling is a non-probability sampling technique in which the study subjects are selected based on certain criteria, such as availability at a given time, willingness to participate, convenient accessibility, and geographical proximity to the researchers (Martinez-Mesa et al., 2016). A list of hospitals from the Ministry of Health of each of the targeted GCC countries were obtained. A secure invitation link containing a survey questionnaire was sent to the participants directly. The study was conducted between November 2019 and April 2020. Three attempted follow-ups were made within the study period to declare non-responders.

The survey was conducted using the online survey platform "Google Forms," which was considered user-friendly and easily accessible with the different web browsers (Rayhan et al., 2013) and was comparable to those of the ASHP survey method (Pedersen et al., 2017; Schneider et al., 2018; Pedersen et al., 2019, 2020). The hospitals were classified based on bed capacity (number of beds), location, type, ownership and accreditation. The participants' hospital responses were collected, cleansed, and analyzed using descriptive statistics before being tabulated as frequencies, and percentages. Descriptive statistics with numbers and frequencies were used to describe the various study variables via the Statistical Package for Social Sciences (IBM SPSS Statistics, version 26).

3. Results

Overall, 123 hospital pharmacy directors were approached, a total of 64 hospitals responded to this survey. The overall response rate was 52%. The details are described in Table 1.

Table 1
Bed capacity, location, type, ownership and accreditation of survey respondents' hospital.

Characteristics	Hospitals (n = 64)	
	Respondent number (n)	(%)
Number of Staffed beds		
<50	7	(10.9)
50–99	8	(12.5)
100–199	14	(21.9)
200–299	6	(9.4)
300–399	11	(17.2)
400–499	6	(9.4)
500–599	5	(7.8)
≥600	7	(10.9)
Country		
Saudi Arabia	31	(48.4)
Kuwait	21	(32.8)
UAE	6	(9.4)
Oman	5	(7.8)
Bahrain	1	(1.6)
Type of hospital		
General	25	(39.1)
Academic/Teaching	4	(6.3)
Secondary care	7	(10.9)
Tertiary care	12	(18.7)
Specialized	16	(25.0)
Ownership		
Government hospital	64	(100.0)
Accreditation		
Accredited*	47	(73.4)
Non-accredited	17	(26.6)

* Joint Commission International, JCI; Central Board of Accreditation for Health-care Institution, CBAHI; Canadian Accreditation Body; United Arab Emirates, UAE.

3.1. Hospital characteristics

The hospitals were classified based on bed capacity (number of beds), location, type, ownership and accreditation. The characteristics of respondents' hospitals are presented in Table 1.

3.2. Prescribing

3.2.1. Drug formulary strategies

Pharmacy directors indicated the extent of various hospital pharmacy and therapeutics (P&T) committee strategies to manage the drug formulary and improve medication use in their hospital (Table 2). Fifty percent of the surveyed hospitals (n = 32) have protocols that transfer authority for product selection and dosing from prescribers to pharmacists. Also, 48.4% of hospitals (n = 31) restrict prescribing of certain categories of medications to specialists or for specific indications or allows prescribing only after consultation with specialists. When taking formulary decisions for the addition of drugs, about 44% (n = 28) of hospitals compare the effectiveness of products, about one-third of the hospitals base formulary decisions are based on rigorous pharmacoeconomic assessment; and use evidence-based clinical practice guidelines. The guidelines include medications, perform medication use evaluations, and use therapeutic interchange and rationing medications based on expected patient outcomes and therapy costs. Less commonly used drug policy tools on making formulary decisions were package labeling (20%) and conducting failure mode and effects analysis (FMEA) (9%).

3.2.2. Electronic Health record (EHR) functionality

Pharmacy directors reported the implementation of various Electronic Health Record (EHR) functionalities used to manage the drug formulary and improve medication use in their hospital (Table 3). Forty-four percent (n = 28) of hospitals have computerized prescriber order entry (CPOE / EHR), and 31% (n = 20) use a drug database for prescribers that only include formulary items. Twenty percent (n = 13) of hospitals communicate drug shortage information and alternatives in their medication ordering platform and enforce formulary restrictions. A very few (n = 12, n = 11) hospitals, respectively, provide decision support when ordering antibiotics to assist with antimicrobial selection and stewardship; and allows entry of non-formulary medications by pharmacy personnel. Only 11% (n = 7) require the access of a therapeutic purpose, indications, safety check for selected look-alike/sound-alike medi-

Table 2
Drug formulary strategies used by hospital P&T committee.

Strategies	Hospitals (n = 64)*	
	n	(%)
Protocols that transfer authority for product selection and dosing from prescribers to pharmacy	32	(50.0)
Restricting prescribing of certain categories of medications to certain specialties and/or indications or only with consultation	31	(48.4)
Comparing the effectiveness of products when making formulary decisions	28	(43.8)
Formulary decisions based on rigorous pharmacoeconomics threshold	24	(37.5)
Evidence-based clinical guidelines	22	(34.4)
Therapeutic interchange	16	(25.0)
Rational use of medications based on expected patient outcomes and cost of therapy	16	(25.0)
Medication use evaluation	17	(26.6)
Formulary decisions based on package labelling	13	(20.3)
Failure Mode and Effects Analysis	6	(9.4)

* Multiple responses.

Table 3
Use of CPOE and/or EHR functionality for formulary system management.

Characteristic	Hospitals (n = 64)*	
	n	(%)
Do not have CPOE / EHR	36	(56.3)
Drug library/database for prescribers only includes formulary items	20	(31.3)
Communicates drug shortage information and alternatives	13	(20.3)
Non-formulary medications can only be entered by pharmacy	11	(17.2)
Enforces formulary restrictions and/or communication to authorized approver/approval service at time of ordering	13	(20.3)
Requires therapeutic purpose / indication as a safety check for most medication orders	7	(10.9)
Electronic drug information embedded into CPOE (e.g. link in CPOE takes user directly to drug information application)	6	(9.4)
Attempts to order non-formulary item are redirected to formulary alternative	7	(10.9)
Provides decision support when ordering antibiotics to assist with antimicrobial selection and stewardship	12	(18.8)
Incorporates dose rounding and/or dose standardization	7	(10.9)
Provides medication cost information to prescribers	3	(4.7)

EHR: Electronic Health Record; CPOE: Computerized Prescriber Order Entry.
* Multiple responses.

cations or high-risk medications, incorporate dose rounding, and dose standardization in computerized prescriber order entry (CPOE), and attempt to order a non-formulary item to formulary alternatives. Less commonly implemented functionality includes providing medication cost information to prescribers.

3.2.3. Types of formulary systems

Fifty-three percent of hospitals (n = 34) have open formularies with few restrictions on prescribers, and 47% (n = 30) have a closed, strict formulary for formulary items and tighter restrictions on non-formulary medication use (Table 4).

3.2.4. Management of formulary systems

Pharmacy directors were asked to report their hospital's formulary management system from the point of submitting the formulary request, committee floor management, and notifications. About 25% (n = 16) of the surveyed hospitals had their formulary system only on paper, and 23% (n = 15) have some components as electronic, e.g., email notifications. Only 15% (n = 10) hospitals have an entire formulary system as electronic (Table 4).

3.2.5. Drug therapy management

Overall, less than 40% (n = 25) of the surveyed hospitals require pharmacists to document drug therapy recommendations and progress notes in a patient's permanent medical record. At about 60% (n = 39) hospitals, pharmacists did not have responsibility for

Table 4
Types and management of formulary systems.

Characteristic	Hospitals (n = 64)	
	n	(%)
Types of formulary		
Closed, strict formulary, with tight restrictions on non-formulary medication use	30	(46.9)
Open formulary, with few restrictions on prescribers	34	(53.1)
Formulary management systems		
Entire formulary system is electronic (complete system with no papers)	10	(15.6)
Some components are electronic e.g. email notifications (still have some components on paper charts)	15	(23.4)
Formulary system is all on paper	16	(25.0)
None of above is applicable	23	(35.9)

managing medication therapies (Table 5). Pharmacists from most hospitals (88%, n = 56) do not have the authority to write medication orders (modify and/or initiate therapy), but some hospitals (n = 12) authorized their pharmacists to order serum medication concentrations and other clinically meaningful laboratory tests. For those hospitals (n = 25) that have pharmacists manage medication therapy, the most commonly managed therapies or medications include anticoagulation therapies (n = 19) followed by parenteral nutrition therapies (n = 18), and antibiotic selection (n = 17) (Table 5).

3.2.6. Pharmacists managing anticoagulation therapy

The frequency of pharmacists managing both dosing and monitoring of anticoagulation therapy is reported in Table 6. Nearly, 22% of hospitals have pharmacists routinely manage warfarin, low molecular-weight heparins (LMWHs) therapy, heparin, and direct oral anticoagulants (DOACs).

3.2.7. Value of pharmacists' intervention services

Data for 35 (54.7%) hospitals were available to demonstrate the value of pharmacists' intervention services (Table 7). For those hospitals that collect data, the most common types of data include frequency and type of interventions (n = 29, 82.9%), time spent on interventions (n = 21, 60.0%), patient satisfaction (n = 14, 40.0%), patient outcomes (n = 13, 37.1%) and cost savings from interventions (n = 11, 31.4%). Less commonly used to demonstrate the value of pharmacist intervention services include readmission rates and decreasing length of stay (n = 5, 14.3%).

3.3. Transcribing

3.3.1. Conveying medication orders to pharmacy

Most pharmacies (n = 39, 60.9%) receive medication orders electronically through CPOE/EHR (Table 8). Handwritten order (original or copy delivered or faxed to a pharmacy) is still a common practice and used by 22 (34.4%) hospitals. Only three (4.7%) hospitals use digital image capture.

3.3.2. Auto verification

Overall, only 14 (21.9%) hospitals use the auto-verification functionality in their CPOE system. Among hospitals that use auto-verification, about 40% do so for selected order types (e.g., all emergency department orders) and identified selected medications for

Table 5
Pharmacist responsibility for managing medication therapies.

Characteristics	Hospitals (n = 64)	
	n	(%)
^Pharmacist responsibility for managing medication therapies	25	(39.1)
Pharmacist did not have responsibility for managing medication therapies	39	(60.9)
Medication, Class, or Therapy Type	Hospitals (n = 25)*	
	n	(%)
Anticoagulation (e.g., Warfarin, LMWH, heparin)	19	(76.0)
Pain and palliative care	5	(20.0)
Parenteral Nutrition (e.g. TPN)	18	(72.0)
Renal dosing antibiotics	9	(36.0)
Aminoglycosides	13	(52.0)
Vancomycin	11	(44.0)
Antibiotic selection	17	(68.0)

*Multiple responses, ^Pharmacists routinely are responsible for managing medication therapies, either by standing protocol or prescriber order and/or delegation, which includes writing medication orders, selecting doses, ordering appropriate laboratory tests, and monitoring patient response to therapy.

Table 6
Anticoagulation management of hospitalized patients by pharmacists.

Characteristics	Hospitals (n = 64)		
	n	%	
Warfarin	Routinely	14	21.9
	On request	19	29.7
	Not at all	31	48.4
Heparin	Routinely	11	17.2
	On request	22	34.4
	Not at all	31	48.4
LMWH	Routinely	13	20.3
	On request	22	34.4
	Not at all	29	45.3
DOACs	Routinely	14	21.9
	On request	17	26.6
	Not at all	33	51.6

LMWH: low molecular weight heparin, DOACs: New oral anticoagulants.

Table 7
Data collection to demonstrate value of pharmacists' intervention services.

Characteristics	Hospitals (n = 64)	
	n	(%)
Data collection performed	35	(54.7)
Types of data collected	Hospitals (n = 35)*	
	n	(%)
Frequency of services (quantity and type)	29	(82.9)
Time	21	(60.0)
Cost savings	11	(31.4)
Outcome	13	(37.1)
Decreased LOS^	5	(14.3)
Readmission rates	5	(14.3)
Patient satisfaction	14	(40.0)

* Multiple responses.

^ LOS = length of stay.

Table 8
Primary method of conveying medication orders to pharmacy.

Method	Hospitals (n = 64)	
	n	(%)
Electronically through CPOE/EHR	39	(60.9)
Handwritten order (original or copy delivered or faxed to pharmacy)	22	(34.4)
Digital image capture (e.g., Pyxis® Connect)	3	(4.7)

EHR: electronic health record; CPOE: computerized prescriber order entry.

auto-verification in specific areas (e.g., pain medications in the emergency department).

3.3.3. Transitions of care

The most frequently reported mechanism used by pharmacists or pharmacy technicians to facilitate transitions of care in their health system is the use of medication reconciliation histories at admission (n = 37, 57.8%) and discharge medication counseling by pharmacists (57.8%), followed by discharge prescription service (dispensing discharge medications by hospital outpatient pharmacy) (n = 36, 56.3%) and use of medication reconciliation histories at discharge from the hospital (n = 28, 43.8%) (Table 9).

3.3.4. Use of technology

In almost all hospitals, pharmacists routinely use a mobile device (a laptop, tablet, computer, and/ or smartphone) while providing patient care. Accessing drug information (n = 58; 90.6%), communication with other healthcare providers (n = 27; 42.2%), adverse drug event reporting (n = 15; 23.4%), and drug shortage

Table 9
Transitions of care processes used by pharmacists or pharmacy technicians.

Process	Hospitals (n = 64)*	
	n	(%)
Use of medication reconciliation histories at admission	37	(57.8)
Use of medication reconciliation histories at transition from/to critical care areas (ICUs)	19	(29.7)
Use of medication reconciliation histories at transition from/to operating room (OR)	15	(23.4)
Use of medication reconciliation histories at discharge from the hospital	28	(43.8)
Design a patient-specific medication-related action plan	11	(17.2)
Communicating orders for home infusion services/ local hospitals	8	(12.5)
Discharge medication counseling by pharmacists	37	(57.8)
Participation in discharge planning	17	(26.6)
Discharge prescription service (dispensing discharge medications by hospital outpatient pharmacy)	36	(56.3)

* Multiple responses.

monitoring (n = 13; 20.3%) are the most commonly performed activities by pharmacists using mobile devices. Activities less commonly performed with a mobile device include medication reconciliation activities and/or transitions of care (18.8%), order review and verification (15.6%), accessing laboratory data (14.1%), and documentation of interventions (12.5%) (Table 10).

3.3.5. Outpatient clinics

About thirty-seven (57.8%) hospital pharmacy directors reported that pharmacists do not provide ambulatory care clinical pharmacy services (Table 11). Twenty-seven (42.2%) hospitals that have pharmacists practicing in primary or specialty care clinics, they participate in anticoagulation management clinics (n = 17, 63.0%), diabetes (n = 9, 33.3%), cardiovascular disease – hypertension (n = 9, 33.3%), medication therapy management (n = 9, 33.3%), and oncology (n = 8, 29.6%). Other types of practices include family medicine (n = 6, 22.2%) and pain and palliative care (n = 5, 18.5%) (Table 11).

3.3.6. Pharmacist review of orders

In more than two-thirds (n = 45) of the surveyed hospitals, pharmacists reviewed and approved all medication orders before the first dose is administered. Less than 10% (n = 5) of hospitals reported using off-site medication order review and entry technology (e.g., a pharmacist at a remote site has access to a pharmacy

Table 10
Pharmacist use of mobile devices (laptop, tablet, computers and/or smartphones) while providing patient care.

Activities involving mobile device use	Hospitals (n = 64)*	
	n	(%)
Drug information	58	(90.6)
Order review and verification	10	(15.6)
Accessing laboratory data	9	(14.1)
Documentation of interventions	8	(12.5)
Medication reconciliation / transitions of care	12	(18.8)
Notification of patients in need of pharmacist assessment	6	(9.4)
Adverse drug event reporting	15	(23.4)
Communication with other healthcare providers	27	(42.2)
Drug shortage monitoring	13	(20.3)
Remote counseling for discharge prescriptions	7	(10.9)

* Multiple responses.

Table 11
Pharmacist involvement in outpatient ambulatory care and primary care clinics.

Characteristics	Hospitals (n = 64)	
	n	(%)
Hospitals that have pharmacists practicing in primary or ambulatory care clinics	27	(42.2)
Pharmacists do not have this responsibility in our hospital	37	(57.8)
Types of Clinics	Hospitals (n = 27)*	
	n	(%)
Anticoagulation	17	(63.0)
General medication therapy management services (MTMS)	9	(33.3)
Diabetes	9	(33.3)
Oncology	8	(29.6)
Cardiovascular disease-hypertension	9	(33.3)
Family medicine	6	(22.2)
Pain and palliative care	5	(18.5)

* Multiple responses.

computer system and all pertinent patient information) during hours when the onsite pharmacy is closed.

3.3.7. Antimicrobial stewardship

Overall, two-thirds (n = 42) of surveyed hospitals reported having an active antimicrobial stewardship program (ASP). Nearly 40.1% of their pharmacists have a clinical support role in their hospital's antimicrobial stewardship program, with other roles including leadership and accountability (28.6%) and data analysis (28.6%) (Table 12).

Multiple strategies are being used in the antibiotic stewardship program in hospitals (Table 12). The most commonly used strategies are education and guidelines (100%), formulary restriction (59.5%), daily review and feedback (57.1%) and clinical decision support (35.7%).

3.3.8. Sterile compounding technology

Sterile preparation workflow management technology (e.g., Baxter DoseEdge, Aesynt/Health Robotics i.v. Soft/ BD Pyxis IV Prep) is used in 10 (15.6%) hospitals. Furthermore, barcode scanning to verify ingredients during the intravenous medication compounding process is used by 11 (17.2%) hospitals. Overall, almost half (n = 29) of the hospital pharmacy department has a USP 797 compliant clean room for compounding sterile preparations (Table 13).

Table 12
Pharmacy involvement and strategies used in antibiotic stewardship program.

Characteristics	Hospitals (n = 64)	
	n	(%)
Hospital does have an active antibiotic stewardship program	42	(65.6)
Hospital does not have antibiotic stewardship program	22	(34.4)
Pharmacists' primary role	Hospitals (n = 42)*	
	n	(%)
Leadership and accountability	12	(28.6)
Data analysis	12	(28.6)
Clinical support	17	(40.5)
Pharmacist not actively involved	1	(2.4)
Strategies used*		
Education/guidelines	42	(100.0)
Formulary/restriction	25	(59.5)
Daily review and feedback	24	(57.1)
Clinical decision support	15	(35.7)

* Multiple responses.

Table 13
Technology used during sterile product preparation.

Sterile compounding technology	Hospitals (n = 64)	
	n	(%)
I.V. workflow management software	10	(15.6)
Barcode scanning to verify ingredients	11	(17.2)
Clean room for compounding sterile preparations	29	(45.3)

4. Discussion

To the best of our knowledge this was the first of its kind survey outlining hospital pharmacy practices across the GCC countries. The survey had representation from all the GCC countries across various types of hospitals with a favorable response rate of 52% compared to ASHP survey of 10.8% in 2019 (Pedersen et al., 2020).

Paucity of data in appraising hospital pharmacy practice in GCC regions, motivated us to publish the outcomes of the survey in a stepwise manner. Hence, this will be the first report in the series and will focus on first two steps of medication use process i.e., prescribing and transcribing practices in GCC countries.

The P&T committee (with the support of physicians, pharmacists, nurses, administrators, risk or quality improvement managers of a hospital) remains responsible for developing medication-use policies that foster effective, safe, and economic use of medications within the institution as part of drug formulary management strategies (Chase, 2010). A formulary aims to improve the general level of prescribing performance and minimize expenses related to drug therapy. Moreover, a formulary has long been seen as a primary solution to control rising drug costs with the balance of clinical effectiveness, and economic impact (Chase, 2010). Our data shows that only half of the surveyed hospitals considered their drug formularies as closed, which is somewhat surprising taking into consideration that all the surveyed hospitals were governmental hospitals. All government hospitals in the GCC operate on a predefined budget from the government. Closed formulary system helps curb the ever-increasing cost of medications in healthcare systems. The most recent ASHP survey in 2019 showed that up to 73% of hospitals have a limited and strict formulary despite the fact the most hospitals in the US are not governmental hospitals (Pedersen et al., 2020). As for formulary management strategies, approximately half of the hospitals reported to have strict protocols in place that transfer authority of product selection and dosing from prescribers to pharmacists and, restrict prescribing of certain categories of medications to specialists. This is also interesting to see in the GCC, in view of the lack of national policies that allow prescribing privileges to pharmacists. Additionally, only 44% of hospitals compare the effectiveness of products, when taking formulary decisions for drug inclusion. This may be explained by the fact that 50% of the hospitals have open formulary system and is significantly lower than US hospitals which reported more than 70% of using such strategies according to the findings from ASHP surveys in 2016 and 2019 respectively, (Schneider et al., 2018; Pedersen et al., 2019). According to the present survey, clinical effectiveness, stringent pharmacoeconomic assessment, and evidence-based clinical practice guidelines were the key parameters accounted for in formulary decisions for the GCC region.

Our study showed that less than half of the surveyed hospitals had CPOE/ EHR while only one third of the hospitals use a drug database for prescribers that only include formulary items. This is in sharp contrast with the practice in the USA where the most recent ASHP survey showed that around 75% of surveyed hospitals in the USA had a CPOE/EHR system (Pedersen et al., 2020). Moreover, around 20% of the hospitals used the CPOE/EHR functionality

in communicating drug shortage information/ alternative medications together with enforcing formulary restrictions and/or communication of approval service at the time of ordering. These findings were in contrast with the findings from the US based study by Pedersen et al., where about 75% of hospitals used a drug database for prescribers that only includes formulary items and about 40% of hospitals communicate drug shortage information and alternatives through CPOE systems (Pedersen et al., 2020).

Pharmacists have a major role to play in drug therapy management, information and education to transitional care. The goal of pharmacist involvement in medication therapy management (MTM) is to ensure the right medication is provided to the right patient and best possible treatment outcomes are achieved (Kehrer et al., 2013). However, the current survey found that only one fifth of the hospital pharmacists in GCC region had the authority to modify and/or initiate therapy and were also not responsible for managing medication therapies compared to around 94% of their USA colleagues who are allowed to modify or initiate therapy according to a policy or a protocol (Pedersen et al., 2020). This specific finding calls for an immediate need of pharmacists' engagement in medication therapy management in the GCC countries.

Our survey indicated that among the pharmacists with the responsibility of managing medication therapies, majority were engaged in providing anticoagulation therapies. As anticoagulants are one of the leading causes of drug related adverse events and are considered high alert medications (Shehab et al., 2016), additional measures should be considered to ensure safe utilization of these medications. It has been reported that pharmacists play an important role in the dosing, monitoring, and education of anticoagulation therapy (Izzettin et al., 2019). A Saudi-based study concluded that implementation of the pharmacist-managed anticoagulation clinic had a positive impact on patient care (Dib et al., 2014). The results from our survey also highlighted that only 20% of the hospitals have pharmacists who routinely manage the dosing and monitoring of anticoagulation therapy compared to 55% of hospitals in the USA (Pedersen et al., 2020). Further, evidence indicates there is an increasing number of hospitals initiating pharmacist-managed anticoagulation programs in an effort to improve efficacy and safety (Lee et al., 2016). Overall, the findings can be readily leveraged by pharmacy practitioners in GCC region looking for local data on critical elements that can affect the medication-use process, safety and quality.

Another important focus area of pharmacy practice in the hospital setting is transcribing and/or reviewing orders which involves the ordering process and delivery of care. Computerized Provider Order Entry (CPOE) is known to accelerate these processes thereby improving efficiency and safety and reducing the number of individuals required to participate in the clinical workflow (Georgiou et al., 2011). The survey findings indicated that less than two third of hospital pharmacies in GCC countries receive medication orders electronically, through CPOE/EHR. The finding was in contrast to other global studies, where the most common method of receiving medication orders in the pharmacies were electronically through CPOE (Alsultan et al., 2012b; Pedersen et al., 2017; Altyar et al., 2020). For example, up to 100% of hospitals in the US implement CPOE/HER systems (Pedersen et al., 2020).

Pharmacists contribute to the transition of care where evidence suggests their involvement in hospital discharge transitions have a positive impact on reduction in hospital readmissions along with improvement in quality of care (Phatak et al., 2016). The results of the current survey revealed that use of medication reconciliation histories at admission (57.8%), at discharge from the hospital (43.8%) and discharge medication counseling (57.8%) were only conducted by pharmacists to facilitate the transition of care. The findings from the Pedersen et al. survey also indicated that the

transition of care was mainly facilitated by using medication reconciliation histories at admission (74.9%) followed by discharge medication counseling (44.6%) (Pedersen et al., 2017).

Increasing influence of technology has also led to an increased interest in the use of mobile devices (a laptop, tablet, computer, and/ or smartphone) in patient care by pharmacists to provide more efficient access to information at the point-of-care. The hospitals in the current survey reported that vast majority of pharmacists in hospitals routinely use a mobile device while providing patient care when accessing drug information (90.6%), and communication with other healthcare providers (42.2%) are the most commonly reported activities. These findings were in line with the global findings wherein 93.6% of pharmacists in USA used mobile devices to access drug information, and 71.6% used the same to communicate with other healthcare providers (Pedersen et al., 2020), whereas 86.6% of pharmacists in Malaysia used smartphones and tablets for drug information (Ming et al., 2016).

Pharmacists are the most accessible healthcare team members regarding drug information. They have the required expertise to provide medication therapy management for patients' primary and preventive care (Manolakakis and Skelton, 2010). In the present survey 57.8% of hospital pharmacy directors reported that pharmacists do not provide ambulatory services. The findings also report that 42.2% of the hospital's pharmacists were practicing in primary or ambulatory care clinics where their participation was limited to anticoagulation management clinics, diabetes, hypertension, general medication therapy management and oncology. Similarly, the 2016 ASHP survey showed that among health systems with ambulatory care clinics, 39.5% have pharmacists practicing in primary or specialty care clinics. Also in line with the current survey findings, pharmacists in the 2016 ASHP survey most commonly practiced in anticoagulation management clinics, oncology, and medication therapy management (Pedersen et al., 2017). With regards to medication management therapy, this survey reported that majority of the hospitals in GCC countries have an active ASP while only 40% of pharmacists have a key role in providing clinical support compared to 80% of US pharmacists who practice in large hospitals. The ASHP 2019 survey also highlights the support provided by pharmacists in antibiotic selection and ASP (Pedersen et al., 2020).

Pharmacists also play an important role in specialized services such as sterile preparation workflow management. The present survey indicated that only 15.6% of hospitals used sterile preparation workflow management technology. However, the use of barcode scanning to verify ingredients during the intravenous medication compounding process was performed only by 17.2% hospitals. The findings were lower than what was reported in the ASHP 2019 national survey, where sterile preparation workflow management technology was used in 46% of medium size hospitals in the US, while the use of barcode scanning was 35.7% in the US setting (Pedersen et al., 2020).

Though our survey gave a current holistic picture of the pharmacy practice patterns in GCC countries, we do acknowledge some limitations of our survey. The survey was restricted to government hospitals with no representation from the private sector from any of the GCC countries. Hence, the findings cannot be generalized, and caution is warranted in their application to private settings in GCC countries. Despite of aforesaid limitation the survey findings suggest promising learning points for the development of strategic initiatives and policies centered on improving pharmacy practices in the GCC region.

5. Conclusion

Pharmacists are the most accessible healthcare team members regarding drug information and medication therapy management;

however, they are the most underutilized healthcare team members. The survey findings can be used by pharmacy practitioners on critical elements that can affect the medication use process's safety and quality. The information can be utilized as a base for benchmarks to international survey outcomes and track progress over time and help identify opportunities for strategic initiatives and policies at a national level to improve practice.

There are major areas for improvement to patient care of which pharmacists are uniquely qualified as the medication experts to have the most meaningful outcomes in all of the domains of safe medication use, efficacy, stewardship programs, immunization and patient education.

The findings of this paper call for a need for all GCC hospitals to compare/investigate their own operations to determine if similar areas of improvement exist. Identification and resolving these gaps would translate into improvement in pharmacy services and the quality of care provided to patients.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jsps.2021.07.013>.

References

- Ahmed Aboousheishaa, A., Hatim Sulaiman, A., Zaman Huri, H., Zaini, S., Adha Othman, N., bin Aladdin, Z., Chong Guan, N., 2020. Global scope of hospital pharmacy practice: a scoping review. *Healthcare (Basel)* 8 (2), 143. <https://doi.org/10.3390/healthcare8020143>.
- Alsultan, M.S., Khurshid, F., Mayet, A.Y., Al-jedai, A.H., 2012a. Hospital pharmacy practice in Saudi Arabia: dispensing and administration in the Riyadh region. *Saudi Pharm. J.* 20 (4), 307–315.
- Alsultan, M.S., Khurshid, F., Salamah, H.J., Mayet, A.Y., Al-jedai, A.H., 2012b. Hospital pharmacy practice in Saudi Arabia: prescribing and transcribing in the Riyadh region. *Saudi Pharm. J.* 20 (3), 203–210.
- Alsultan, M.S., Mayet, A.Y., Khurshid, F., Al-jedai, A.H., 2013. Hospital pharmacy practice in Saudi Arabia: drug monitoring and patient education in the Riyadh region. *Saudi Pharm. J.* 21 (4), 361–370.
- Altyar, A.E., Sadoun, S.A., Alradadi, R.S., Aljohani, S.S., 2020. Evaluating pharmacy practice in hospital settings in Jeddah City, Saudi Arabia: prescribing and transcribing-2018. *Hosp Pharm.* 55 (5), 306–313.
- Chase, K.A., 2010. Introduction to hospital and health-system pharmacy practice. Part II: Managing Medication Use. Chapter 4: Medication management. American Society of Health-System Pharmacists, Bethesda, Md., 2010, pp. 59–80.
- Dib, J.G., Mohammed, K., Momattin, H.I., Alshehri, A.M., 2014. Implementation of pharmacist-managed anticoagulation clinic in a Saudi Arabian Health Center. *Hosp Pharm.* 49 (3), 260–268.

- Doloresco, F., Vermeulen, L.C., 2009. Global survey of hospital pharmacy practice. *Am. J. Health Syst. Pharm.* 66, S13–S19.
- Georgiou, A., Prgomet, M., Markewycz, A., Adams, E., Westbrook, J.J., 2011. The impact of computerized provider order entry systems on medical-imaging services: a systematic review. *J. Am. Med. Inform. Assoc.* 18, 335–340.
- Hughes, R.G., Blegen, M.A., 2008. Medication administration safety. In: Hughes, R.G. (Ed.), *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*, Rockville (MD).
- Izzettin, F.V., Celik, S., Acar, R.D., Tezcan, S., Aksoy, N., Bektay, M.Y., Sancar, M., 2019. The role of the clinical pharmacist in patient education and monitoring of patients under warfarin treatment. *J. Res. Pharmacy.* 23, 1157–1163.
- Kehrer, J.P., Eberhart, G., Wing, M., Horon, K., 2013. Pharmacy's role in a modern health continuum. *Can. Pharm. J. (Ott.)* 146 (6), 321–324.
- Lee, T., Davis, E., Kielly, J., 2016. Clinical impact of a pharmacist-led inpatient anticoagulation service: a review of the literature. *Integr. Pharm. Res. Pract.* 5, 53–63.
- Lemay, J., Bayoud, T., Husain, H., Sharma, P., 2019. Assessing the knowledge, perception and practices of physicians and pharmacists towards medication reconciliation in Kuwait governmental hospitals: a cross-sectional study. *BMJ Open.* 9 (6), e027395. <https://doi.org/10.1136/bmjopen-2018-027395>.
- Manolakis, P.G., Skelton, J.B., 2010. Pharmacists' contributions to primary care in the United States collaborating to address unmet patient care needs: the emerging role for pharmacists to address the shortage of primary care providers. *Am. J. Pharm. Educ.* 74 (10), S7. <https://doi.org/10.5688/aj7410S7>.
- Mansur, J.M., 2016. Medication safety systems and the important role of pharmacists. *Drugs Aging* 33 (3), 213–221.
- Martínez-Mesa, J., González-Chica, D.A., Duquia, R.P., Bonamigo, R.R., Bastos, J.L., 2016. Sampling: how to select participants in my research study? *An. Bras. Dermatol.* 91 (3), 326–330.
- Ming, L.C., Hameed, M.A., Lee, D.D., Apidi, N.A., Lai, P.S.M., Hadi, M.A., Al-Worafi, Y. M.A., Khan, T.M., 2016. Use of medical mobile applications among hospital pharmacists in Malaysia. *Therap. Innov. Regul. Sci.* 50 (4), 419–426.
- Pedersen, C.A., Schneider, P.J., Ganio, M.C., Scheckelhoff, D.J., 2019. ASHP national survey of pharmacy practice in hospital settings: monitoring and patient education-2018. *Am. J. Health Syst. Pharm.* 76, 1038–1058.
- Pedersen, C.A., Schneider, P.J., Ganio, M.C., Scheckelhoff, D.J., 2020. ASHP national survey of pharmacy practice in hospital settings: prescribing and transcribing-2019. *Am. J. Health Syst. Pharm.* 77, 1026–1050.
- Pedersen, C.A., Schneider, P.J., Scheckelhoff, D.J., 2017. ASHP national survey of pharmacy practice in hospital settings: prescribing and transcribing-2016. *Am. J. Health Syst. Pharm.* 74, 1336–1352.
- Phatak, A., Prusi, R., Ward, B., Hansen, L.O., Williams, M.V., Vetter, E., Chapman, N., Postelnick, M., 2016. Impact of pharmacist involvement in the transitional care of high-risk patients through medication reconciliation, medication education, and postdischarge call-backs (IPITCH Study). *J. Hospital Med.* 11 (1), 39–44.
- Rayhan, R.U., Zheng, Y., Uddin, E., Timbol, C., Adewuyi, O., Baraniuk, J.N., 2013. Administer and collect medical questionnaires with Google documents: a simple, safe, and free system. *Appl. Med. Inform.* 33, 12–21.
- Schneider, P.J., Pedersen, C.A., Scheckelhoff, D.J., 2018. ASHP national survey of pharmacy practice in hospital settings: dispensing and administration-2017. *Am. J. Health Syst. Pharm.* 75, 1203–1226.
- Shehab, N., Lovegrove, M.C., Geller, A.I., Rose, K.O., Weidle, N.J., Budnitz, D.S., 2016. US emergency department visits for outpatient adverse drug events, 2013–2014. *JAMA* 316 (20), 2115. <https://doi.org/10.1001/jama.2016.16201>.
- Vogelberg, F.R., Benjamin, D., 2011. The medication-use process and the importance of mastering fundamentals. *P T.* 36, 651–652.