Medication reconciliation practices in Gulf cooperation council countries: A review

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ABSTRACT
The objective of this review was to assess the current practices on medication reconciliation (MedRec) carried out in hospitals in Gulf Cooperation Council countries. A literature search was conducted in English focusing on finding existing publications on MedRec and/or medication discrepancies in different hospital settings in the GCC countries. Publications from the following databases were retrieved: SCOPUS, EBSCO, PUBMED, and Google Scholar. The retrieving period was from December 1st to 10th, 2021 and all publications since inception were included. The selection criteria were based on the PRISMA statement. Twenty-seven studies were included in this review as they met the inclusion criteria. Out of 27 included studies, 15 studies implemented MedRec during one or all the following stages: admission; transfer, and discharge. The review showed that more than half of the studies originated in Saudi Arabia (n=15, 55.5%) followed by Kuwait (n=4, 15%), then Qatar and the United Arab Emirates (n=3 each, 11%), and Oman (n=2, 7.4%), and none were conducted in the Kingdom of Bahrain. The published studies showed a wide variation in the current practice of MedRec in GCC hospitals because of different policies from the Ministry of Health and the hospitals. This review outcome concluded that MedRec is likely a recognized and actively promoted process in these countries where it is comparatively more practiced in Saudi Arabia. The MedRec practice in GCC had many problems and limitations, and efforts are needed to overcome these barriers.

INTRODUCTION
In cases where a patient with an existing prescription seeks a physician’s consultation, most physicians either add, omit, or change patients’ medications which results in a new list of medications. If both lists are not compared, reviewed, and updated, medication discrepancies can occur [1]. These discrepancies may happen upon hospital admission, discharge, during the transfer from one department to another, or at transfer from hospital to other healthcare facilities. The discrepancies include the following errors: omission, addition, duplication, dosage, and frequency [2]. Medication error (ME) is a serious problem in each healthcare system. The Joint Commission reported that ME is considered as one of the highest types of errors in medical practice [3]. By adopting the World Health Organization (WHO) statement, “all MEs are potentially avoidable,” it is possible to reduce or even prevent ME by developing more effective healthcare systems and implementing patient safety initiatives [4]. Proper comparison and reviewing of patients’ medication lists in addition to appropriate patient history taking can assure fewer medication discrepancies and better clinical outcomes. This is simply what medication reconciliation (MedRec) means. In definition, MedRec is “the process of creating the most accurate list possible of all medications a patient is taking—including drug name, dosage, frequency, and route—and comparing that list against the physician’s admission, transfer, and/or discharge
METHODOLOGY

Search strategy

An organized search strategy was followed to detect the relevant research. The following databases were retrieved: SCOPUS, EBSCO, and PUBMED. In addition, Google Scholar was searched to identify further eligible studies.

The search terms (title, abstract, keyword, text) were “MedRec” OR “medication discrepancies” AND (GCC OR Saudi Arabia OR United Arab Emirates (UAE) OR Kuwait OR Bahrain OR Oman OR Qatar). All searches spanned from database inception until December 10th, 2021 and all publications available until that date were included. The review included journal articles, review papers, letters to editors, conference papers, and conference reviews published in English language only. Including research outside English, even if existed, was not within the scope of the study.

Selection criteria

Preferred reporting items for systematic reviews and meta-analyses statement served as the basis for the selection criteria [9]. The search focused on finding existing publications on MedRec in different hospital settings. Studies conducted on community pharmacies were excluded. Articles from any other country were not included because the search was exclusively limited to the GCC countries. A total of 2,549 search articles were excluded whereas 191 records were included at this stage.

Quality assessment

The review included journal articles, review papers, case reports, letters to editors, conference papers, and conference reviews. All duplications were checked carefully to sustain the quality of the review.

All abstracts of the included studies were checked thoroughly to decide if the articles were relevant and a deep evaluation of full articles was conducted later.

After checking the duplicate records and other ineligibility criteria, 27 articles met our inclusion and exclusion criteria, and they were selected for this review. Figure 1 displays the inclusion and exclusion criteria for the search at each stage (PRISMA statement). At this stage, the researchers registered the protocol of this review in the PROSPERO database (ID: CRD42022310577).

Figure 1. PRISMA 2020 flow diagram for systematic reviews.
Data analysis

The initial classification of studies was based on which GCC country they were conducted. Then, they were classified based on their outcomes into (1) process measures and (2) outcome measures including clinical parameters measurements and healthcare utilization. Studies were also grouped based on the main element of intervention into (1) pharmacist-related and (2) other types of interventions including implementing electronic MedRec tools and educating staff about MedRec.

RESULTS

Search results

As illustrated in Figure 1, the search generated a total of 2,585 records from SCOPUS, EBSCO, and PUBMED databases; an additional 157 were identified via Google Scholar search to give a total of 2,745. Records marked as ineligible by automation tools were 2,549, while the screened ones were 34 from the 3 mentioned databases and only 22 studies were selected after reviewing the full articles. For records yielded from Google Scholar search, a manual screening was done where some were excluded because of irrelevant topics (n = 112), studies were not conducted in GCC (n = 7), and duplicated articles (n = 33) resulted in including only five studies from Google Scholar database. Finally, the total number of studies included in this review was 27.

Description of included studies

Twenty-six of these included studies were journal articles and one case report. A total of 20 studies were quantitative [prospective cross-sectional (n = 9); retrospective cross-sectional (n = 4); descriptive cross-sectional (n = 3); analytical cross-sectional (n = 1); randomized control studies (n = 2); case report (n = 1)]. Other research designs were a mixed-method research design (n = 3), an exploratory qualitative design (n = 1), and quality improvement projects (n = 3). The study designs reflected that 74% of the studies were quantitative in nature with a lack of interventional studies (Table 1).

The type of hospitals varies between private and governmental hospitals: tertiary, secondary, and primary healthcare centers. The studied hospital departments included the hospital ward, pediatric ward, oncology ward, internal medicine ward, surgical ward, cardiology ward, ambulatory dialysis department, emergency department, and intensive care unit. The most common type of ward chosen was internal medicine.

An overview of the included studies

The included studies’ overview is shown in Table 2. The period of data collection of these studies ranged from 1 day to 1 year and 8 months. The average of the study duration of all included studies is 6 months. Three studies did not state the duration. Most studies were conducted in tertiary hospitals (n = 19, 70%) while few of them were done in teaching or academic hospitals (n = 4, 15%). Two studies (7.4%) were performed in primary care hospitals, and the remaining were completed in general and secondary care hospitals (n = 1 each, 3.7%).

Out of 27 included studies, 15 studies implemented MedRec during one or all of the following stages: admission, transfer, and discharge. Nine studies did the implementation during patient admission, three studies at the discharge stage, and one study at the transfer stage. One study did the intervention during the admission and discharge stages, while only one study investigated the MedRec process during the three stages: admission, transfer, and discharge.

Subjects recruited in the included studies

The recruited subjects in the included studies vary as most studies recruited patients (n = 13, 48%), followed by healthcare professionals (n = 11, 41%), and fewer studies were conducted by reviewing patients’ prescriptions and medications from the systems (n = 3, 11%).

Out of the 11 studies that were performed on healthcare professionals, 7 of them were concentrated only on pharmacists, and the remaining 4 included physicians, pharmacists, and nurses. The total number of pharmacists that have been recruited was 994 (69%) in comparison with 285 (20%) nurses and 164 (11%) physicians.

Practice of MedRec in GCC

The review showed that more than half of the studies originated in Saudi Arabia (n = 15, 55.5%) followed by Kuwait (n = 4, 15%), then Qatar and the UAE (n = 3 each, 11%), and Oman (n = 2, 7.4%). The review did not find any MedRec study conducted in the Kingdom of Bahrain (Fig. 2). The first-ever study on MedRec was conducted in Saudi Arabia in 2009, and it was published in 2011 by Abuyassin et al. [10] One study conducted in Bahrain which focused on the need to improve the medical curriculum by incorporating more medication safety courses and assessments was excluded since it was not related to MedRec practice in the hospital [11]. Figure 2 illustrates the distribution of studies by year.

Analysis of keywords using the word cloud generator

A word cloud generator was used to analyze the keywords written in the included articles (Fig. 4). The larger the words appeared in the image, the more common the keywords were. For instance, the keywords “medication,” “reconciliation,” and “Saudi Arabia” were shown in a larger font as compared to other keywords, indicating these words were mentioned more frequently in the articles.

DISCUSSION

Discussion of MedRec practice in each GCC country

Kingdom of Saudi Arabia

More than half of the included studies were carried out in Saudi Arabia (n = 15, 55.5%). This reflects the persistent
### Table 2. An overview of the included studies.

<table>
<thead>
<tr>
<th>Study</th>
<th>Published year</th>
<th>Sample size</th>
<th>Paper type</th>
<th>Study design</th>
<th>Hospital type</th>
<th>Setting</th>
<th>Total number of prescriptions reviewed</th>
<th>Prevalence of total medication discrepancies</th>
<th>Type of discrepancy</th>
<th>MedRec stage</th>
<th>Duration</th>
<th>Country</th>
<th>Studies’ measures</th>
<th>Main element of intervention</th>
<th>Articles mentioned the barriers on implementing MedRec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bawazeer et al. [25]</td>
<td>2021</td>
<td>98 patients</td>
<td>Quantitative</td>
<td>Randomized controlled study</td>
<td>Teaching hospital</td>
<td>Hospital outpatient clinics</td>
<td>N/A</td>
<td>26 DTRPs</td>
<td>Indication DRPs (n = 10), drug dosage regimen DRPs (n = 8), other miscellaneous DRPs (n = 8)</td>
<td>Discharge</td>
<td>7 months</td>
<td>Saudi Arabia</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al-Dahshan and Kehyayan [27]</td>
<td>2021</td>
<td>5,639 older adults</td>
<td>Quantitative</td>
<td>Cross-sectional, retrospective study</td>
<td>Primary</td>
<td>23 primary healthcare centers in Qatar</td>
<td>5,639</td>
<td>4,289 (76%)</td>
<td>35.0% medications should be avoided, 56.0% medications should be used with caution</td>
<td>N/A</td>
<td>6 months</td>
<td>Qatar</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Al Anazi [23]</td>
<td>2021</td>
<td>276 pharmacists</td>
<td>Quantitative</td>
<td>Descriptive, cross-sectional study</td>
<td>Tertiary</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>not mentioned</td>
<td>Saudi Arabia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dannan and Ellahham [7]</td>
<td>2021</td>
<td>60 reviewed charts</td>
<td>Qualitative and quantitative</td>
<td>Prospective quality improvement study</td>
<td>Tertiary</td>
<td>Pediatric ward</td>
<td>60</td>
<td>Initially 8.98%, decreased to 3.9% after intervention</td>
<td>Duplication of orders (30%), unnecessary medication (10%), wrong doses (20%)</td>
<td>Transfer</td>
<td>20 months</td>
<td>UAE</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Katoue and Ker [33]</td>
<td>2019</td>
<td>110 pharmacists</td>
<td>Qualitative and quantitative</td>
<td>Mixed-method research design</td>
<td>Tertiary</td>
<td>Six general hospitals and five specialized hospitals</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>6 months</td>
<td>Kuwait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lemay et al. [34]</td>
<td>2019</td>
<td>351 physicians and 214 pharmacists</td>
<td>Quantitative</td>
<td>Descriptive, cross-sectional study</td>
<td>Secondary</td>
<td>Six governmental hospitals</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>5 months</td>
<td>Kuwait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marhar et al. [22]</td>
<td>2018</td>
<td>375 patients</td>
<td>Quantitative</td>
<td>Cross-sectional, prospective study</td>
<td>Teaching hospital</td>
<td>Internal medicine</td>
<td>375</td>
<td>609</td>
<td>Drug omission (37%), discrepant dose (66%), discrepant frequency (17%), drug commission (10%), incorrect drug (11%), and missing dose (8%)</td>
<td>Admission</td>
<td>3 months</td>
<td>Saudi Arabia</td>
<td>√</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Study</th>
<th>Published year</th>
<th>Sample size</th>
<th>Paper type</th>
<th>Study design</th>
<th>Hospital type</th>
<th>Setting</th>
<th>Total number of prescriptions reviewed</th>
<th>Prevalence of total medication discrepancies</th>
<th>Type of discrepancy</th>
<th>MedRec stage</th>
<th>Duration</th>
<th>Country</th>
<th>Articles mentioned the barriers on implementing MedRec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Hashar et al. [38]</td>
<td>2018</td>
<td>587 patients</td>
<td>Quantitative</td>
<td>Randomized controlled study</td>
<td>Tertiary</td>
<td>Medical ward</td>
<td>587</td>
<td>Omission of a medication (26%) and discharge (35%)</td>
<td>Admission/ discharge</td>
<td>12 months</td>
<td>Oman</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Katuse and Ker [32]</td>
<td>2018</td>
<td>110 hospital pharmacists</td>
<td>Qualitative and quantitative</td>
<td>Mixed-method research design</td>
<td>General and tertiary</td>
<td>Inpatient, outpatient, and casualty pharmacies</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>6 months</td>
<td>Kuwait</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Abdalgani et al. [17]</td>
<td>2018</td>
<td>286 adult patients</td>
<td>Quantitative</td>
<td>Cross-sectional, prospective study</td>
<td>Tertiary</td>
<td>Oncology unit, medical unit, and surgical unit</td>
<td>5,633</td>
<td>Omissions (77%), commissions (13%), dosing errors (7%), and frequency errors (3%)</td>
<td>Admission</td>
<td>3 months</td>
<td>Saudi Arabia</td>
<td>√*</td>
<td>√</td>
</tr>
<tr>
<td>Al-Jazairi et al. [18]</td>
<td>2017</td>
<td>374 cardiac surgery patients</td>
<td>Quantitative</td>
<td>Cross-sectional, prospective study</td>
<td>Teaching hospital</td>
<td>Cardiac surgery department</td>
<td>1,000</td>
<td>Omission 207 (79.61%), inappropriate dosing 25 (9.61%), inappropriate substitution 19 (7.3%), inappropriate new medication 11 (4.23%), frequency 2 (0.76%)</td>
<td>Admission/ transfer / discharge</td>
<td>7 months</td>
<td>Saudi Arabia</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Al-Rashoud et al. [19]</td>
<td>2017</td>
<td>173 adult patients</td>
<td>Quantitative</td>
<td>Cross-sectional, prospective study</td>
<td>Tertiary</td>
<td>Internal medicine ward</td>
<td>173</td>
<td>Omission (67%), commission (12%), changed frequency (9%), therapeutic duplication (9%), wrong duration (3%)</td>
<td>At discharge</td>
<td>8 weeks</td>
<td>Saudi Arabia</td>
<td>√*</td>
<td>√</td>
</tr>
</tbody>
</table>

Continued
| Study                  | Published year | Sample size | Paper type               | Study design                        | Hospital type | Setting                  | Total number of prescriptions reviewed | Prevalence of total medication discrepancies | Type of discrepancy | MedRec stage | Duration | Country               | Studies' measures                                                                 |
|-----------------------|----------------|-------------|--------------------------|-------------------------------------|---------------|--------------------------|----------------------------------------|---------------------------------------------|---------------------------------------------|-------------------|------------|-----------|----------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Marhar et al. [21]    | 2017           | 328 patients | Quantitative, prospective study | Crosssectional, prospective study | Teaching hospital | Internal medicine and surgical wards | 1,419                                  | 1,081                                        | Omission (43.5%) medical patients versus 51.2% surgical patients, modification of dose, frequency or route (7.360% medical patients vs. 10% surgical patients), Incorrect drug (3.7% medical patients vs. 9.9% surgical patients), therapeutic duplication (24.3% medical patients vs. 11.5% surgical patients), drug interaction (17.4% medical patients vs. 21% surgical patients) | Admission                      | 1 month        | Saudi Arabia         | √*                                                                                                                                          |
| Al-Hashar et al. [37] | 2017           | 464 responses | Quantitative             | Crosssectional, prospective study | Tertiary       | Inpatient units            | N/A                                     | N/A                                         | N/A                                         | N/A                       | 2 months        | Oman                  | √                                                                                                                                          |
| Shemeshi et al. [35]  | 2016           | 27 healthcare professionals | Qualitative and quantitative | Mixedmethod research design        | Tertiary       | Five hospitals in Abu Dhabi Emergency room | N/A                                     | N/A                                         | N/A                                         | N/A                       | Not mentioned | UAE                   | Not mentioned                                                                 |
| Marhar et al. [16]    | 2016           | 1            | Quantitative             | Case report                        | Tertiary       | Emergency room             | 1                                       | 1                                           | Adverse drug effects                     | Admission                      | 7 days         | Saudi Arabia         | √                                                                                                                                          |
| Khelt et al. [29]     | 2014           | 56 reviewed medications | Quantitative, crosssectional study | Descriptive, crosssectional study | Primary         | Private consultation area within the clinic | 52 medications reviewed                 | 175 DTRPs                                   | non-adherence (31%), need for education (23%), and adverse drug reactions (23%)             | N/A                       | 3 months        | Qatar                 | √                                                                                                                                          |
| Taha et al. [8]       | 2016           | 8,576 patients | Quality improvement project | Prospective quality improvement study | Tertiary       | General medicine           | 8,576                                  | Not mentioned                              | Not mentioned                             | Admission                      | 19 months        | UAE                   | √                                                                                                                                          |

Continued
<table>
<thead>
<tr>
<th>Study</th>
<th>Published year</th>
<th>Sample size</th>
<th>Paper type</th>
<th>Study design</th>
<th>Hospital type</th>
<th>Setting</th>
<th>Total number of prescriptions reviewed</th>
<th>Prevalence of total medication discrepancies</th>
<th>Type of discrepancy</th>
<th>MedRec stage</th>
<th>Duration</th>
<th>Country</th>
<th>√* Indicates studies that evaluated the severity of medication discrepancies and their potential to cause harm to patients.</th>
<th>Articles mentioned the barriers on implementing MedRec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alghanem et al. [41]</td>
<td>2021</td>
<td>77 patients</td>
<td>Quantitative</td>
<td>Cross-sectional, retrospective study</td>
<td>Tertiary</td>
<td>Ambulatory dialysis and nephrology departments</td>
<td>853 medications reviewed</td>
<td>55</td>
<td>Discrepant frequency (n = 24), incorrect drug (n = 18), discrepant dose (n = 13)</td>
<td>Admission</td>
<td>6 months</td>
<td>Kuwait</td>
<td>√*</td>
<td>√</td>
</tr>
<tr>
<td>Sonallah et al. [28]</td>
<td>2017</td>
<td>251 records</td>
<td>Quantitative</td>
<td>Cross-sectional, retrospective study</td>
<td>Tertiary</td>
<td>Intensive care unit, medical and surgical wards</td>
<td>1,640 medications reviewed</td>
<td>16.70%</td>
<td>Omissions (66.4%), different dose (14.9%), different drug (12%), frequency (7.2%), route (3.6%), duplication (0.8%)</td>
<td>Admission</td>
<td>7 months</td>
<td>Qatar</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Alghamdi et al. [10]</td>
<td>2011</td>
<td>60 patients</td>
<td>Quantitative</td>
<td>Cross-sectional, prospective study</td>
<td>Tertiary</td>
<td>Medicine, emergency, cardiology wards</td>
<td>564 medications reviewed</td>
<td>37%</td>
<td>Omissions (35%), dosage error (35%), frequency (27%), commission (3%)</td>
<td>Admission</td>
<td>2 months</td>
<td>Saudi Arabia</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Al-Jamahi et al. [15]</td>
<td>2014</td>
<td>65 patients</td>
<td>Qualitative</td>
<td>An exploratory qualitative design</td>
<td>N/A</td>
<td>One day meeting</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>1 day</td>
<td>Saudi Arabia</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Aljumah [14]</td>
<td>2013</td>
<td>78 hospitals</td>
<td>Quantitative</td>
<td>Cross-sectional, prospective study</td>
<td>Tertiary</td>
<td>Interviewed Survey</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>4 months</td>
<td>Saudi Arabia</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>Aljumah [13]</td>
<td>2013</td>
<td>18 patients</td>
<td>Quantitative</td>
<td>Cross-sectional, prospective study</td>
<td>Tertiary</td>
<td>Psychiatric hospitals</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Not mentioned</td>
<td>Saudi Arabia</td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

DTRPs: drug therapy-related problems.
UAE: The United Arab Emirates.
efforts from many researchers in the Kingdom to minimize medication discrepancies by practicing MedRec. Based on the information gathered from the Ministry of Health (MOH) website, MOH has improved the quality of care in Saudi Arabia by implementing the National e-health system in 2011. In 2015, The National eHealth Strategy and Change Management Office published a document on the MedRec process [12]. Although the flowchart of the process is mentioned, it is not stated who has to perform it. The conducted review revealed that the first study done in GCC countries on MedRec was in Saudi Arabia in 2009; however, it was published in 2011 [10]. The first research aimed at minimizing MEs by taking an accurate patient’s medication history. Subsequent studies evaluated the medication safety practice in Saudi Arabian hospitals and explored the challenges from healthcare professionals’ perspectives [13,14]. These studies had an impact on the research field in Saudi Arabia and other Gulf countries as they encouraged other researchers to conduct studies toward improving medication safety practices. It was clear that at that time there was a lack of medication safety practices in many hospitals due to the absence of pharmacists’ involvement in this process [13]. Their results were supported by another study done on all psychiatric hospitals in Saudi Arabia in 2013 which reported only a quarter of hospitals initiated MedRec-apart from almost half of the pharmacy directors believed that they do not have enough resources to manage discrepancies [14]. Aljadhey et al. [15] decided to do discussion sessions with the healthcare professionals to understand in depth the main barriers that prevent them from practicing MedRec. This study was the only qualitative study found in this review. As shown in Table 2, underreporting of MEs, workloads, and improper communication between healthcare providers and their patients were the main challenges to medication safety practice as stated by healthcare professionals, whereas miscommunication between health organizations, lack of use of technologies, and inadequate medication safety programs in hospitals were the main factors that lead to medication safety problems [14]. An interesting quality improvement project focusing on educational and monitoring programs to improve compliance with the MedRec process during admission at King Faisal Specialist Hospital and Research Centre was carried out in 2015 by Almidani et al. [6] Although this research was implemented in one department and during admission, which could be a limitation, yet, their initiative was the first of its kind in GCC. This review found that there was only one case report study conducted in Saudi Arabia by Mazhar et al. [16], who reported two serious adverse drug effects caused by MedRec failure during hospital admission. In the last 6 years in SA, there was a strong recognition of the role of pharmacists in the MedRec process and in identifying unintentional medication discrepancies [17–23]. According to the results of Al-Ghanmi and Al-Borie [24], pharmacists should have enough knowledge and training about the MedRec process to conduct it efficiently. Bawazeer et al. [25] shared their positive experience of involving pharmacy students in such a process and concluded that this involvement may reduce the pharmacists’ workload.

**Qatar**

The hospital pharmacy sector in Qatar has developed new clinical pharmacy services including MedRec that have been implemented in many public hospitals. The Ministry of Public Health in Qatar published “The National Health Strategy 2018–2022 project” with the goals of improvement in patients’ care and plans for the “integrated model of high-quality care and delivery” [26]. This review revealed three studies conducted in Qatar related to MedRec designed as cross-sectional studies and they aimed at detecting medication discrepancies and their types [27–29].

**Kuwait**

The MOH in Kuwait established “The National Accreditation Program for Hospitals” in 2008, which mainly focused on improving the quality of care and patient safety by “creating, implementing, monitoring, and evaluating programs and standards of quality and safety across all departments of...
MOH” [30]. Our review revealed that publications about MedRec in Kuwait had started in 2018 followed by another two studies in 2019 and a very recent one in 2021. As in other developing countries, pharmaceutical care implementation in Kuwait had several barriers [31], which were divided into three categories: organizational, technical, and professional barriers. In 2018, another study was done to investigate the practice of MedRec in Kuwait hospitals and to understand in depth the main challenges in implementing it [32]. The authors concluded that MedRec was poorly practiced in hospitals and pharmacists had a limited role in it. They also adopted a mixed-method research in 2019 based on simulation-based workshops to train the pharmacists in the MedRec process in addition to surveying them to know their perceptions about such processes [33]. The participants’ preparedness to implement MedRec increased after attending the workshops which indicated that such types of workshops can enrich the pharmacists’ knowledge and enhance the skills required to implement MedRec. Another study conducted by Lemay et al. [34] indicated that the awareness level about MedRec was low among physicians compared to hospital pharmacists although physicians were the main providers involved in MedRec. This could be attributed to the MOH policy in Kuwait which put the physicians at the core of the process.

United Arab Emirates

The UAE consists of seven Emirates and its healthcare system has three health regulatory authorities. Northern Emirates (Sharjah, Ajman, Umm Al Quwain, Ras Al Khaimah, and Fujairah) follow the Ministry of Health and Prevention authority which is the federal health authority in the UAE while Abu Dhabi and Dubai have local health authorities.

Our review revealed three studies about MedRec conducted in AbuDabi hospitals. Two of them were quality improvement projects [7, 8] while the third one used a mixed research design [35]. One study was done in community pharmacies in the UAE and it was excluded as the setting did not meet our inclusion criteria. The Abu Dhabi Health Authority has considered MedRec as a critical patient safety method and it is one of the KPIs for its hospitals [7, 8]. In the two quality improvement projects, electronic tools were used to improve MedRec’s compliance during hospital admission and transfer, respectively. The results of the two studies were impressive as MedRec’s compliance improved and was sustained for a certain period of time. The third study was done by Shemelisi et al. [35], who used a mixed research design to explore the experiences of healthcare providers on medicine management in the elderly. A discussion with a focus group revealed that healthcare providers including physicians, pharmacists, and nurses had adequate knowledge about history taking and MedRec. However, allocating these tasks was not clear among them.

Oman

The MOH in the Sultanate of Oman had issued a policy in 2019 for MedRec practice in hospitals [36]. It explains the process in detail and it is mentioned that the pharmacist is responsible for reviewing the medication history taken at the time of admission by the physicians or nurses. This review revealed two studies conducted in Oman about MedRec [37, 38]. Both are quantitative studies conducted in a tertiary hospital. The first study was done in 2017 in Sultan Qaboos University Hospital before the implementation of a structured MedRec process in the hospital. The disagreement of the three healthcare providers (physicians, nurses, and pharmacists) in their roles and responsibilities to implement the MedRec process was expressed in this study although they all agreed on its importance to minimize medication discrepancies. Obstacles to implementing MedRec addressed from their perspectives include lack of time, unreliable sources of medication history, and lack of communication between healthcare providers. In 2018, the same research group conducted another study in the same hospital to evaluate the impact of MedRec on patients’ clinical outcomes after discharge. Their findings supported the importance of implementing MedRec as a medication safety practice to reduce drug related problems.

Bahrain

The National Health Regulatory Authority in Bahrain had issued a strategic plan for 2021–2025 which emphasized safe and high-quality health services. [39] Although many studies stated the high prevalence of MEs in Bahrain, none was done to examine the medication safety intervention to minimize such errors. A study by Al Khaja et al. [40] revealed that in Bahrain the percentage of incorrect prescriptions is around 90%. Our review did not find any MedRec study conducted in the Kingdom of Bahrain. However, there is one study talking about medication safety in medical education and emphasizing the need to improve the medical curriculum toward further medication safety courses and assessments. This study was published as a letter to an editorial in 2015, but it was excluded as it did not meet our inclusion criteria [11].

Studies’ measures

Process measures

Fifteen articles evaluated medication processes by looking at the drug therapy-related problems (DTRPs), unintentional medication discrepancies, and rate of preventable ADEs, and all of them showed a reduction in these outcomes (Table 2), while remaining studies were exempted from this classification (n = 12). Most studies stated that drug omission was the most predominant type of discrepancy (n = 9), followed by adverse drug reaction (n = 2), frequency, dosage regimen, duplication, and nonadherence (n = 1 each) Figure 3.

Five studies evaluated the severity of medication discrepancies and their potential to cause harm to patients (Table 2). Al-Rashoud et al. [19] classified 76% of the unintentional medication discrepancies as major discrepancies while Mazhar et al. [22] and Alghanem et al. [41] reported that 60% of their discrepancies had the potential to cause moderate to severe harm compared to 52% in Abdulghani et al. [17]. In addition, Mazhar et al. [21] rated 17.7% as potentially harmful discrepancies.

Outcome measures

Two studies evaluated the outcome measures [25, 38] by studying the readmission rate and impact of MedRec on
clinical parameters; however, their results were not statistically significant which could be due to the short period of time and technicality in their study designs. None of the studies had accessed the cost-effectiveness of implementing the MedRec process. However, only one study estimated the medication-related cost reductions [41], which concluded that MedRec resulted in an overall reduction in medication costs of US $85.33 per patient for one month and this was attributed to the discontinuation of unnecessary medications.

Main element of intervention

Pharmacist-related intervention

The 12 studies reported on pharmacist-led intervention included mostly licensed pharmacists, clinical pharmacists, and pharmacy residents, although students with advanced pharmacy practice experience were also involved (Table 2). These studies elaborated on the multiple roles of pharmacy staff in the MedRec process and showed how their contributions significantly reduced medication discrepancies, DTRPs, and preventable adverse drug events.

It is worth mentioning that although including students in doing such comprehensive intervention could be questioned and debated, this could be quite useful in limited resources facilities to overcome this barrier after educating and training them to be highly competent. In addition, pharmacy technicians could be a useful choice in low-resource hospitals that do not have enough pharmacists to lead the MedRec process as recommended by Abdulghani et al. [17].

Other types of interventions including implementing electronic MedRec tools and educating staff about MedRec

Three articles had shared their successful quality improvement stories using electronic MedRec tools along with educating and training their staff about the MedRec process [6–8]. Taha et al. [8] used an electronic tool to perform MedRec on admission and they selected the general medicine department for the project being the busiest ward in their hospital. Their results showed a significant impact of the admission MedRec electronic tool on improving physician compliance to perform the process (from 40% to more than 85%) which was sustained for the last 4 months of the study. What was missing in their design was the absence of a system that could measure the sustainability of the improvement.

After 5 years, researchers did an almost similar project in the same hospital aiming to improve the transfer of MedRec compliance from critical care to the pediatric ward [7]. Initially, their results showed an increase in compliance from 56% to 72%, but it was not sustained. In the last phase of their project, they adopted the Irish Health Service Executive Model which yielded a sustainable improvement of 85% that lasted for 1 year of the study. The research team highlighted the importance of implementing such a model that focuses on stakeholders’ engagement and cultural change. The third study was conducted by Almidani et al. [6] to enhance the admission MedRec compliance in a pediatric ward. Their results showed an improvement in compliance from 0% to 15% to 96%. Common themes of these three successful projects included (1) providing education sessions on MedRec to staff; (2) emphasizing the importance of interprofessional collaboration; (3) continuous follow-up and reminders for the healthcare providers; and finally (4) the support from senior management. In quality improvement projects, it is very important to collectively gather all the possible ways that can lead to success.

Whose job is MedRec?

In an attempt to find a clear answer about whose responsibility is MedRec, Al-Hashar et al. [37] conducted a survey to ask the three healthcare providers (physicians, pharmacists, and nurses) this question. Their responses showed a disagreement among the three professions on who is best suited to perform this process as pharmacists and physicians considered themselves the main providers of this service, while nurses perceived physicians and pharmacists did not have a major role in this process. Interestingly, one study reported a positive acceptance of physicians not only toward pharmacists’ implementation of the process but also accepted all pharmacists’ intervention recommendations without rejecting any of them [18]. This result reflected the recognition of healthcare providers about the important role of pharmacists in this process. Another study investigated who is doing the process more accurately, pharmacists or physicians? They reported that physicians inaccurately recorded patients’ medication history during their admission and they strongly supported pharmacists being the experts in this field to be engaged in the MedRec process with physicians and nurses [17]. Their results match with Lemay et al. [34] as they assessed and compared the knowledge and perception of pharmacists and physicians toward MedRec. Their results indicated that pharmacists had more knowledge about MedRec, got more training in university about MedRec, and perceived MedRec as a valuable intervention for patient safety than physicians.

Barriers and challenges

Barriers toward implementing the MedRec process were an important area of interest in Saudi Arabia, Kuwait, and Oman with six studies devoted to this topic (Table 2). The most common barrier was the lack of policy which was mentioned in three articles [15,24,32] followed by the lack of pharmacists’ time and resources as they were mentioned in two articles [32,37]. Other obstacles that were mentioned include lack of communication among healthcare providers as well as between the patients’ and the providers, lack of management support, lack of standardized tools for MedRec, inadequate staff and workload on healthcare providers, difficulty in accessing patient information, and finally lack of agreement on roles and responsibilities. These challenges are similar to what had been addressed in the literature in other countries [42–44].

Key successful factors to improve the practice

Identifying the barriers that can render proper implementation of the MedRec process will help in suggesting key points that will enhance patients’ safety practices in hospitals. Aljadhey et al. [15] highlighted the potential areas and they mentioned studies and publications on medication safety are the key elements to improve the practice. Other factors include providing continuous education and training to healthcare providers, effective communication between
healthcare providers, and organizational management support in addition to defining the roles and responsibilities of each provider. In addition, using information technology and standardized tools in implementing such intervention will facilitate the process. The tendency toward change and the fear of consequences were reported as one of the barriers. The culture of blame will prevent healthcare providers from reporting MEs. The WHO stated underreporting of MEs is a global problem and healthcare providers should be educated about the point of reporting is not to blame, but rather to learn from each other in order to enhance patient safety.

**Limitations and strengths of this review**

This review included all published research related to MedRec practice in GCC hospitals till December 10th, 2021, which means any recently published articles after this date were not included. Also, this review has limited the search to articles published in the English language which could be considered a limitation as publications in other languages were excluded. In addition, the heterogeneity in designing the studies led to difficulty in drawing a conclusion on the most effective MedRec approaches. The novelty of this review is that it is the first to be done to explore the practice of MedRec in GCC countries in hospital settings. Moreover, this review highlights the barriers that prevent the implementation of effective MedRec and suggests the factors that can successfully contribute to a better implementation.

**CONCLUSION**

The published studies showed a wide variation in the current practice of MedRec in GCC hospitals because of different policies from the MOH and the hospitals. This review outcome concluded that MedRec is likely a recognized and actively promoted process in these countries where it is comparatively more practiced in Saudi Arabia. The MedRec practice in GCC had many problems and limitations, and efforts are needed to overcome these barriers. Enhancing the practice could be achieved by sharing the experience and publishing the results and outcomes of any patient safety initiative in hospitals. Documenting these barriers is the key element to addressing the problems and resolving them. The research findings showed the need for further research to educate healthcare professionals on MedRec and to see its impact on clinical outcomes.

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