

# Nurses' perceptions of the clinical information system in primary healthcare centres in Qatar: a cross-sectional survey

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## ABSTRACT

**Background** Qatar is one of the fastest growing countries in the Arabic region. Primary Health Care Corporation (PHCC) is the main provider of primary health services in Qatar and employs 1600 nurses. In 2014, PHCC started to migrate from paper to electronic documentation of patient records using a clinical information system (CIS). Since implementation, the use of CIS and perception of users have not been assessed.

**Objective** This study measured nurses' perceptions regarding the utilisation, quality and user satisfaction with the CIS in PHCC.

**Methods** Using a pre-existing survey, a cross-section of nurses from six health centres in Qatar were systematically selected and invited to participate in the study. Eighty-nine surveys were completed (response rate: 98.8%) and descriptive analyses were performed.

**Results** Nurses' perceptions regarding the utilisation, quality and user satisfaction with the CIS were positive. Nurses indicated that the CIS is a resource for clear, accurate and up-to-date data and that their performance improved due to the CIS. Yet responses to an open-ended question in the survey revealed some concerns related to the CIS, such as patient confidentiality, system downtime and time constraints.

**Conclusion** Ensuring that the CIS is facilitating nurses' work is crucial to guarantee high-quality care to the community. The findings provide foundational data to help PHCC to understand nurses' perceptions and to take steps to overcome challenges that nurses face related to the CIS in their daily practice. This work could also provide direction for future research.

Qatar is a peninsular Arab country located in Western Asia.<sup>1</sup> During the past 20 years, Qatar has experienced significant social and economic transformations due in part to the discovery of oil.<sup>2</sup> These changes resulted in rapid urbanisation, which consequently increased the burden of non-communicable diseases.<sup>3</sup> This epidemiological transformation and the growth of Qatar's population have increased the volume of data. In 1997, there were 513 455 people in Qatar, and in

## Summary

### What is already known?

- ▶ Nurses have reported both positive (eg, increased satisfaction) and negative (eg, breach of patient confidentiality) aspects related to clinical information system (CIS) in prior studies.
- ▶ Nurses have concerns related to confidentiality of patients' records with CIS use.

### What does this paper add?

- ▶ Overall, nurses' perceptions regarding the utilisation, quality and user satisfaction with the CIS were positive.
- ▶ Nurses indicated that the CIS is a resource for clear, accurate and up-to-date data and that their performance improved due to the CIS.
- ▶ However, responses to an open-ended question in the survey revealed some concerns related to the CIS, such as patient confidentiality, system downtime and time constraints.

### How might it impact on clinical practice in the foreseeable future?

- ▶ The findings of this study can be used to minimise the challenges that nurses face in their daily practice related to the CIS.
- ▶ The findings can help decision makers to establish support systems (eg, educational sessions) to overcome the challenges nurses face with the CIS.
- ▶ The findings can also support decision makers to raise awareness of the current policies related to patient confidentiality which may help minimise nurses' concerns related to breaches in patient confidentiality.

2017 the population increased to 2 639 211.<sup>4</sup> Thus, there was a critical need for an advanced technology system to capture this increasing amount of data.

Qatar initiated the first steps in developing a primary healthcare system in 1954, and in 1978 the Ministry of Health launched healthcare services in nine centres. Currently, there are 23 primary healthcare centres distributed



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across three regions: Central, Western and Northern. These centres are considered the first entry point for patients into the healthcare system.

Nurses play a key role in Primary Health Care Corporation (PHCC). They are the first point of contact for patients entering health centres, and they make up the largest component of the workforce. In 2014, PHCC launched a new clinical information system (CIS) and provided training prior to implementation. Changes in the way nurses document their work have a significant impact on their practice.<sup>5</sup> Hence, gaining a better understanding about nurses' perceptions related to their use, the quality and their level of satisfaction with the CIS system in PHCC is important. This may ultimately help PHCC to make necessary changes to improve nurses' use and satisfaction with the CIS, which in turn may improve patient care. The objective of this study was to measure PHCC nurses' perceptions regarding the utilisation, quality and user satisfaction with the CIS.

A review of literature (2006–2017) was conducted using Cumulative Index to Nursing and Allied Health Literature, PubMed, Web of Science and PsycINFO including the following keywords: *clinical information system, Electronic health record, primary health care, nurses, perception*. Ten relevant articles were included in this review.<sup>6–15</sup> All studies were conducted in non-Arab countries using qualitative, quantitative or mixed-methods approaches. There was considerable variability across the studies in terms of nurse characteristics, inclusion of other healthcare professionals in the sample and type of information system evaluated. The results in all studies combined both positive aspects of CIS (eg, change in attitude/knowledge, increased satisfaction and nurses' strong intentions to adopt the electronic health record) and negative aspects (eg, gaps in knowledge and research related to electronic medical record (EMR), lack of proper staff training prior to EMR implementation and confidentiality concerns). Four of the ten studies focused on nurses' perceptions alone,<sup>8,9,11,12</sup> whereas the remaining six studies combined nurses' perceptions with patients, physicians and other healthcare professionals in primary care.

## METHODS

A cross-sectional survey was conducted in 6 of the 23 health centres distributed across three regions (ie, 9 in the Northern region and 7 in the Central and Western regions). Two health centres from each region were selected to obtain a representative sample. Driving distance and time to the first author's home influenced the choice of health centres selected for data collection.

Systematic sampling was used to obtain a study sample. In systematic sampling, individuals from a population of interest are sampled at regular intervals, such as taking every fifth person.<sup>16</sup> A list of nurses in each PHCC was used as a sampling frame. Numbers were assigned in sequence to the names on each list. Starting from the third subject, every subject with an odd number was enlisted for the

study until a total of 15 subjects per site were selected. If a nurse was not on duty, they were excluded and another participant with the next odd number was selected. A contact person who did not have any supervisory relationship with the nurses assisted the researcher with data collection.

Inclusion criteria were (1) male or female nurse working at a primary healthcare centre in Qatar who completed the PHCC CIS training programme, (2) nurses who had worked with the CIS for at least 6 months, (3) self-reported ability to read and understand English, (4) provides direct patient care and (5) willing to participate in the study.

In 2016, there were 1600 nurses across 23 health centres. A study involving all 23 health centres will require a sample of 341 nurses, assuming a 95% confidence level for estimates ( $p=0.05$ ). Study sample was adjusted to 89 ( $341/23*6$ ) in accordance with the design that envisaged recruitment from only 6 out of 23 sites. A systematic sampling was employed to select subjects from the list of nurses provided per site.

The tool used in the study was 'Degree of computerization and use of computer-based patient information systems in Japanese'.<sup>17</sup> This questionnaire includes 34 items divided into three sections: (1) extent of use of EMR systems (12 items), (2) quality of EMR systems (13 items) and (3) user satisfaction (9 items). Response options for sections 1 and 2 were 'never/almost never', 'seldom', 'about half the time', 'most of the time' and 'always/almost always'. Response options for section 3 were 'not at all', 'very little', 'some', 'great' and 'very great'. Participants were given the option of selecting 'N/A' (not applicable) for sections 1 and 2, whereas 'don't know' was the option in section 3.

The reliability and validity of this tool were examined in a study of 1666 nurses in 42 hospitals in Japan.<sup>17</sup> The reliability for each subscale was assessed. Cronbach's alpha across these subscales ranged from 0.79 to 0.94. Content validity was assessed based on previous surveys and a review of the tool by a panel of expert nurses in informatics. Construct validity was examined through factor analysis and correlational analyses. Reliability levels for each subscale were determined.

A few modifications to the original tool were made to render it more specific to PHCC. Permission to modify the tool was obtained from the authors of this tool. The following were the modifications: (1) 'bedside' was replaced by 'health center'; (2) CBPIS (for computer-based patient information systems) was replaced by 'CIS/Clinical Information System'; (3) 'hospital' was replaced by 'Practice area in PHCC'; and (4) 'nurse care worksheets' was replaced by 'Ambulatory intake form/nurses' notes'.

Data were entered by the first author into Excel application (V.2016) for Windows, and then the Excel file was transferred to SPSS (V.24) for analyses. Descriptive analyses (frequencies, means, SD and percentages) were performed.

**Table 1** Sociodemographic data

Demographic features	Percentages
<b>Gender</b>	
Female	80.9
Male	19.1
<b>Education</b>	
Diploma	18.0
Bachelor's degree	77.5
Master's degree	4.5
PhD	–
<b>Age groups (years)</b>	
<30	24.7
30–40	47.2
>40	27.0
<b>Years worked at PHCC (years)</b>	
1–2	18.0
3–5	28.1
6–10	27.0
>10	25.8
<b>Marital status</b>	
Single	20.0
Married	78.7
Divorced	–
Widowed	–
<b>Birthplace</b>	
Qatar	3.4
Other	96.6

Missing data: for age=0.10%; for years worked at PHCC=0.10%; and marital status=0.30%.

PHCC, Primary Health Care Corporation.

## RESULTS

Ninety participants were recruited and 89 returned their surveys (98.8% response rate). The mean age of the participants was 37 years (SD ±8.7), 80.9% were female, 78.7% were married, 96.6% were born outside Qatar, and 77.5% had a bachelor's degree. Nearly three-quarters (73.1%) of the respondents have worked in a health centre for less than 10 years. A summary of the sociodemographic data is presented in [table 1](#).

The mean scores of most items were above 4 out of 5. This suggests that overall the nurses have positive perceptions related to CIS, used the system in their practice and are relatively satisfied with the system. The mean scores are presented in [table 2](#).

[Table 3](#) illustrates participants' responses to the six possible response options. Generally speaking, a higher percentage of participants selected the response options 'most of the time or always/almost always'.

Although the percentage of N/A responses were relatively low, there were three questions that had a higher N/A response rate. These were the following: (1) 'Obtain

**Table 2** Mean scores of participant responses to survey items

Items	Mean score (SD)
1. Review the patient's problems.	4.37 (0.817)
2. Obtain information on investigation or treatment procedures.	4.56 (0.753)
3. Obtain the results from new tests or investigations.	4.45 (0.754)
4. Enter daily nursing care notes.	4.69 (0.535)
5. Capturing patient observations at the health center	4.21 (1.113)
6. Answer questions concerning general medical knowledge (concerning treatment, symptoms, complications etc).	4.15 (1.061)
7. Obtain results of test and investigations.	4.56 (0.783)
8. To check drug information (such as allergy and interactions).	4.56 (0.811)
9. Write nursing care plans.	4.18 (1.293)
10. Write nurse care worksheets (Ambulatory intake form).	4.49 (0.990)
11. Collect patients' info for discharge reports.	4.11 (1.570)
12. Document physical assessment of patients.	4.57 (0.916)
13. How often does the system provide the precise information you need?	4.44 (0.690)
14. How often does the information content meet your needs?	4.42 (0.580)
15. How often does the system provide reports that seem to be just exactly what you need?	4.34 (0.656)
16. How often does the system provide sufficient information?	4.38 (0.649)
17. How often is the system accurate?	4.34 (0.673)
18. How often are you satisfied with the accuracy of the system?	4.29 (0.710)
19. How often do you think the output is presented in a useful format?	4.25 (0.758)
20. How often is the information clear?	4.27 (0.780)
21. How often is the system user-friendly?	4.15 (0.899)
22. How often do you get the information you need in time?	4.34 (0.722)
23. How often does the system provide up-to-date information?	4.29 (0.710)
24. How often can you count on the system to be up and available?	4.46 (3.162)
25. How often is the system subject to frequent system problems and crashes?	3.37 (1.142)
26. Do you feel CIS are useful?	4.57 (0.620)
27. Do you feel your performance has improved due to CIS?	4.56 (0.656)

Continued

Table 2 Continued

Items	Mean score (SD)
28. Do you feel the quality of your work has improved?	4.51 (0.676)
29. Do you feel CIS is worth the time and effort required to use it?	4.39 (0.806)
30. Do you feel quality of information has improved?	4.51 (0.740)
31. Do you feel the CIS has been a success in your health center?	4.58 (0.636)
32. Do you feel CIS is an important system for your health center?	4.62 (0.699)
33. Do you feel safety of patient has improved?	4.48 (0.799)
34. Overall, are you satisfied with the CIS in your health center?	4.65 (0.676)

CIS, clinical information system.

results of test and investigations' (item 7, (4.5%)), (2) 'Write Nursing care plans' (item 9, 9%), and (3) 'Collect patients' info for discharge reports' (item 11, 19.1%).

Twenty-six participants (23.1%) provided comments to one open-ended question (ie, any other comments) at the end of the survey. Five categories (themes) were identified: (1) *confidentiality* concerns: for instance, some participants said that the use of the CIS improved patient privacy, while others believed that there was a lack of confidentiality; (2) *functionality of the system*: some participants mentioned that the system was slow, that there were internet connectivity problems and the system automatically logged off at times, and many complained of the difficulty to deal with the clients' anger during downtime; (3) *value for the time*: some participants stated that the use of CIS saved their time, whereas others believed that the system's downtime, logging in and documenting were time-consuming; (4) *improvement in patient care*: some participants said that the CIS improved workflow, improved documentation process and enhanced the accessibility to patients' data; and (5) *staff satisfaction*: some participants described the CIS as very useful, nice, supportive, helpful and a good method.

## DISCUSSION

The positive findings in this study are similar to the results of existing studies.<sup>6-9 11 12 14</sup>

The high mean scores may suggest the possibility of acquiescence bias. One possible strategy to help minimise the risk of this type of bias in future quantitative studies would be to include a statement in the instructions to participants advising them that there are no 'right' or 'wrong' answers and that they should select the 'best' response option for them.

Although the satisfaction rate was high, the responses to one open-ended question showed that some participants

had mixed perceptions related to CIS utilisation and patient confidentiality. Concerns related to patients' confidentiality were similarly found in another study.<sup>10</sup> Currently, PHCC has policies to ensure the confidentiality of patient data. One possible strategy that may help to minimise nurses' concerns regarding confidentiality of patient data would be to provide inservice education to raise awareness of existing policies. There are other strategies that organisations can adopt to protect the confidentiality of patient data. One study<sup>18</sup> stated that patients' health data are at risk of disclosure by mistakes or by theft. The authors stated that it is the responsibility of leaders in healthcare sectors to consider the ethical issues related to electronic health records (EHRs) and frame proper policies to maintain patients' privacy and confidentiality. They suggested measures such as firewalls and antivirus software programs to help maintain patients' confidentiality, and they also suggested that staff must not share their password with others and to log off the computer when leaving the room.

Downtime can be defined as a time during which authorised users will not be able to access and use the applications to perform their routine tasks.<sup>19</sup> The authors stated that there are two types of downtimes: scheduled and unscheduled. Although participants' responses to the survey item related to the CIS 'saving time' were positive, comments to the open-ended question indicated that some participants found that the system's downtime, logging in and documenting were all time-consuming, which made patients dissatisfied. Participants did not give enough details in the open-ended question to understand how downtime, logging in and documenting were time-consuming. These findings have implications for future research. Future studies could use a mixed-method approach that will allow for a deeper understanding of issues related to 'time' and the CIS within the context of PHCC in Qatar. Additionally, future research could capture patients' perceptions related to their satisfaction/dissatisfaction with the CIS system.

Fahrenholz and colleagues<sup>19</sup> suggested that there must be downtime training courses for all new employees and that regular refresher training should be provided to all staff. Moreover, the authors stated that another effective way to prepare staff for downtime and evaluate their readiness is *downtime drill*, which will truly reflect staff's knowledge and skills to deal with downtime.<sup>19</sup> Currently PHCC has a regular downtime drill every 3–6 months to ensure that all PHCC staff are skilled in dealing with unexpected downtimes. As part of the drill, healthcare managers of each healthcare centre must ensure that all hard copy forms, such as blood investigation request forms, referral slips and medication prescription sheets, are available and located in the prearranged location in the event of a system downtime. Future focus group interviews could help to better understand the challenges that nurses and other healthcare professionals experience related to downtime.

**Table 3** Participant responses to survey items

Items	Never/ Almost never (%)	Seldom (%)	About half the time (%)	Most of the time (%)	Always/ Almost always (%)	N/A (%)
1. Review the patient's problems.	-	5.6	4.5	37.1	52.8	-
2. Obtain information on investigation or treatment procedures.	1.1	1.1	4.5	28.1	64.0	1.1
3. Obtain the results from new tests or investigations.	-	3.4	5.6	33.7	57.3	-
4. Enter daily nursing care notes.	-	-	3.4	24.7	71.9	-
5. Capturing patient observations at the health center.	3.4	6.7	10.1	27.0	50.6	2.2
6. Answer questions concerning general medical knowledge (concerning treatment, symptoms, complications etc).	1.1	7.9	15.7	29.2	42.7	3.4
7. Obtain results of test and investigations.	-	2.2	6.7	28.1	58.4	4.5
8. To check drug information (such as allergy and interactions).	1.1	3.4	3.4	22.5	69.7	-
9. Write nursing care plans.	2.2	13.5	12.4	16.9	46.1	9.0
10. Write nurse care worksheets (Ambulatory intake form).	4.5	2.2	2.2	21.3	69.7	-
11. Collect patients' info for discharge reports.	9.0	12.4	6.7	21.3	31.5	19.1
12. Document physical assessment of patients.	3.4	1.1	2.2	24.7	65.2	3.4
13. How often does the system provide the precise information you need?	-	2.2	3.4	43.8	49.4	1.1
14. How often does the information content meet your needs?	-	-	4.5	49.4	46.1	-
15. How often does the system provide reports that seem to be just exactly what you need?	-	-	10.1	46.1	43.8	-
16. How often does the system provide sufficient information?	-	1.1	5.6	47.2	46.1	-
17. How often is the system accurate?	-	2.2	4.5	50.6	42.7	-
18. How often are you satisfied with the accuracy of the system?	-	2.2	7.9	48.3	41.6	-
19. How often do you think the output is presented in a useful format?	-	2.2	12.4	43.8	41.6	-
20. How often is the information clear?	-	3.4	9.0	46.1	40.4	1.1
21. How often is the system user-friendly?	2.2	2.2	13.5	42.7	39.3	-
22. How often do you get the information you need in time?	-	1.1	11.2	40.4	47.2	-
23. How often does the system provide up-to-date information?	-	1.1	10.1	48.3	39.3	1.1
24. How often can you count on the system to be up and available?	-	5.6	7.9	55.0	30.3	1.1
25. How often is the system subject to frequent system problems and crashes?	1.1	31.5	14.6	34.8	18.0	-
26. Do you feel CIS are useful?	-	1.1	3.4	32.6	62.9	-
27. Do you feel your performance has improved due to CIS?	-	-	9.0	25.8	65.2	-
28. Do you feel the quality of your work has improved?	-	-	10.1	29.2	60.7	-
29. Do you feel CIS is worth the time and effort required to use it?	1.1	-	12.4	32.6	52.8	1.1

Continued

Table 3 Continued

Items	Never/ Almost never (%)	Seldom (%)	About half the time (%)	Most of the time (%)	Always/ Almost always (%)	N/A (%)
30. Do you feel quality of information has improved?	1.1	1.1	3.4	36.0	57.3	1.1
31. Do you feel the CIS has been a success in your health center?	-	-	6.7	29.2	62.9	1.1
32. Do you feel CIS is an important system for your health center?	1.1	1.1	1.1	29.2	66.3	1.1
33. Do you feel safety of patient has improved?	1.1	2.2	4.5	32.6	58.4	1.1
34. Overall, are you satisfied with the CIS in your health center?	1.1	-	3.4	24.7	69.7	1.1

CIS, clinical information system; N/A, not applicable.

Although one reviewed study measured the impact of the CIS on patient outcome,<sup>20</sup> no studies in Qatar have measured the impact of CIS on patients' outcomes. Future research could measure outcomes such as patient safety and satisfaction with CIS within the context of Qatar.

Five of the ten studies reviewed measured the perceptions of nurses and other healthcare providers, but the studies did not present individual scores for each category of provider.<sup>6 10 13-15</sup> Although nurses are members of the interprofessional healthcare team in PHCC, they have unique roles and responsibilities. For instance, as mentioned before, nurses are the first point of contact for clients and provide direct patient care. There is a need for future research that explores the unique perceptions of nurses, or studies that present the results for each healthcare professional individually.

Most of the participants in this study were female, which is similar to the findings of other studies.<sup>6-8 11</sup> Since the vast majority of nurses are women worldwide, the male perspective will typically be under-represented in most surveys. It would be interesting to conduct gender-specific focus groups to determine if gender-specified perceptions regarding CIS exist.

Although minor modifications were done to the tool to improve clarity for nurses working at PHCC, there is a need for further refinement that better aligns with the role of nurses in PHCC in Qatar.<sup>1</sup> For example, items could include nurses' roles related to home-care patients, school health and women's health.

A sampling frame was used, which helped to avoid unintended selection bias and allowed everybody in the sites to have an equal chance of being selected. The use of the list of nurses greatly facilitated recruitment process. For future studies, this sampling approach can be used since the study sites maintain a current list of all their nursing staff. Overall, recruitment did not pose any challenges. In this study only 15 participants were selected from each of the six study sites. A study with a larger sample size involving all 23 PHCC sites would allow opportunities for more nurses to participate.

As mentioned previously, three items had relatively high 'N/A' responses. The question with the highest N/A response rate (19.1%) asked nurses if they 'Collect patients' info for discharge reports'. This rate may partly be related to the fact that the word 'discharge' is not a familiar word in PHCC. For future research in Qatar, this question could be deleted. The second highest N/A rate (9.0%) asked nurses if they use the CIS to 'Write Nursing care plans'. This rate may be partly related to the fact that PHCC nurses do not 'write nursing care plans'. However, they do write plans for ongoing treatments, such as weekly dressing change. Therefore, the term 'writing nursing care plans' could be replaced with 'writing nursing treatment plans'. Lastly, the third highest N/A response rate (4.5%) asked nurses if they used the CIS to 'Obtain results of test and investigations'. This rate may be partly related to the fact that, although nurses in PHCC have access to patients' tests and investigations, they usually do not obtain the results,

since physicians concentrate more on this activity. Hence, this item could be deleted in future studies.

### Limitations

The sample size was relatively small; thus, the results cannot be generalised at this point of time. The original response options (ie, not at all, very little, some, great, very great and don't know) for section 3 (items 26–34) were missed when the survey tool was formatted. Therefore, the same response options (ie, never/almost never, seldom, about half the time, most of the time, always/almost always and N/A) were used throughout the survey. Hence, the results for section 3 should not be compared with other similar studies that have used the original response options.

### CONCLUSION

This study evaluated 89 nurses' perceptions related to CIS in six health centres in Qatar. Overall, nurses had positive perceptions related to CIS system. However, some challenges were reported in the open-ended question related to patient confidentiality and downtime. Findings of this study have implications for practice policy and future research. The findings can help decision makers in PHCC to establish support systems to overcome the challenges nurses face with the CIS. For instance, PHCC can provide educational sessions for nurses to overcome the challenges of downtime. These findings can also support decision makers in PHCC to raise awareness of the current policies related to patient confidentiality which may help minimise nurses' concerns related to breaches in patient confidentiality. Lastly, future studies could use a qualitative approach that will allow for a deeper understanding of issues related to 'time' and the CIS within the context of PHCC in Qatar. Additionally, future research could capture patients' perceptions related to their satisfaction/dissatisfaction with the CIS system.

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**Contributors** MHM made substantial contributions to the conception and design, writing of the manuscript, acquisition of data, analysis and interpretation of data, provided the final approval of the version to be published, and agrees to be accountable for all aspects of the work. KB made substantial contributions to the conception and design, interpretation of data, involved in the drafting and revising of the manuscript critically for content, provided the final approval of the version to be published, and agrees to be accountable for all aspects of the work. EN made substantial contributions to conception and design, data analysis and interpretation, and approved the final version for publication. SAA provided input on study design, interpreted the results, was involved in revising the manuscript critically for important intellectual content and approved the final version for publication.

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purpose and ethical considerations (eg, confidentiality of the data) were explained to the participants. They were asked to complete a survey, place it in a sealed envelope and give it back to the contact person.

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**Data availability statement** No data are available.

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