Assessment of Key Performance Indicators of the Primary Health Care in Oman: A Cross-Sectional Observational Study

Badria Al Rashidi[1], Ahmed H. Al Wahaibi[1], Ozayr Mahomed[2], Zainab Al Afifi[1], and Salah T. Al Awaidy[1] (iD)

Abstract

Objective: Effective primary health care (PHC) is the key to attaining universal health coverage. The key performance indicators (KPIs), is a component of quality improvement in the PHC service sector that provides feedback to inform and better public service delivery and promoting accountability. We assessed the current performance of PHC service by using KPIs to identify the possible challenges that necessitate being confronted, highlight the lessons learnt, and propose steps towards improvements. **Methods:** We conducted a cross-sectional observational study across 12 PHC centers in 6 governorates in Oman during the period of June 2017 to June 2018. Secondary data from the computerized medical records of the PHC centers on six key indicators, accessibility, workload, outcomes, timeliness, satisfaction, and safety were analysed to assess the performance of PHC service and to identify challenges confronted and propose steps towards further service improvement. **Results:** The mean overall KPIs scores across the ten PHC centers were 174.5 (SD: 9.80) or 67.01%. The overall scores were normally distributed with a median score of 175 (IQR: 171-181). The lowest percentage score was obtained by Al Qabil (61.35%) with the highest mark being at Wadi Kabir (70.54%). The mean score across all KPIs was 3.84 (SD:0.94) with a median score of 3.9 (IQR: 3.43-4.5). Of the six KPI components, safety (4.85), satisfaction (4.67), timeliness (4.44), and accessibility (4.31) had the highest performance scores, whilst workload (4.15) and outcomes (3.75) lagged behind. **Conclusions:** Performance across the KPIs exhibited a considerable variation between facilities, with workload and outcome performing lower than other components. The findings of this study offered a measure of internal strengths that need to be sustained, challenges that require quality improvement initiatives, and external factors such as social determinants that impact overall performance PHC.

Keywords

accessibility, timeliness, outcomes, satisfaction, safety, workload, key performance indicators, primary health care, Oman

What Are the New Findings?

- Little is known about performance in Primary health care (PHC) center in Oman
- No research has been conducted to insure the key performance indicators (KPIs) in Oman PHC centers
- Few validated tools have been used to date and which instruments are best suited to the African context

What Do the New Findings Imply?

- Variations in the performance across facilities and performance indicators

- Findings assist in identifying internal strengths and challenges
- Unhealthy lifestyle factors (obesity) are an inadequately addressed
- Poor blood glucose control amongst a high proportion of patients

[1]Ministry of Health, Muscat, Oman
[2]University of KwaZulu Natal, Durban, KwaZulu-Natal, South Africa

Corresponding Author:
Salah T. Al Awaidy, Health Affairs, Ministry of Health, P.O. Box 393 PC 100, Muscat, Masqat, Oman.
Email: salah.awaidy@gmail.com

- Validated PHC performance measures are required in Oman to guide, support and evaluate efforts to improve access to the quality PHC system

Introduction

Primary health care (PHC) is the backbone of any health care system and remains undoubtedly a fundamental component in improving the health outcomes of the community.[1] PHC is essential for strengthening of health organizations and achieving sustainable development goals (SDGs) and universal health coverage. Thus, countries with comprehensive and robust PHC system that are based on high performing PHC are able to attain better health outcomes, healthier populations more equitably, have lower all-cause morbidity and mortality rates, and higher life expectancy.[2]

A number of countries including Oman have invested substantially in PHC with the aim of achieving global health objectives of Universal Health Coverage, Integrated People centered Health Services and the health related Sustainable Development Goals. Despite, the central role of PHC the measurement of PHC performance is a challenge globally. Measuring the performance of the primary health care system provides thorough understanding of primary health care as well as enables system and service improvements.[1]

Performance measurement, and the espousal of the key performance indicators (KPIs), is a part of quality improvement in any service sector that offers feedback to inform and better public service delivery whilst promoting accountability by demonstrating to key stakeholders the results that government is achieving.[3,4]

The Primary Health Care Performance Initiative Framework was launched to identify the vital elements of a strong primary health maintenance organization with a view to inform what should be measured and drive efforts to improve PHC. The framework is embedded within a health system strengthening approach and adopts a logic model systems approach describes the system enablers and inputs required to deliver optimal quality primary healthcare services in order to achieve effective service coverage and overall health system outcomes.[5] Therefore, performance measurement is a component of character improvement in any service sector.[4,5] The rigorous evaluation of PHC performance will provide a benchmark of the current functioning as well guidance for the future PHC services planning and improvement.

In any country, the healthcare of the citizens is the responsibility of their government. In Oman, the PHC is the designated facility where the patient's first contact with the healthcare system occurs and it incorporates a range of activities.[6] The PHC facility provides solutions to the vast majority of a person's health problems in the best way with a minimum economic burden.[2] In addition, not only health care providers, but also the administrators and the government are interested to recognize the quality and efficiency of the health care delivery and potential gaps within the system that will undoubtedly support them further improve the service.[5]

Various groups of indicators are used to assess the performance of PHC facilities including accessibility, appropriateness, acceptability, effectiveness, coordination of care, continuity of care and safety.[7] All the key performance indicators (KPIs) in PHC will undoubtedly serve to accurately value the caliber of service offered by the PHC. Nevertheless, it should be noted that the performance of PHC is complex and multidimensional and therefore all the perspective of the quality of care in PHC is unlikely to be promptly assessed by a group of KPIs. The KPIs typically analyzes 3 essential aspects of its function: quality, efficiency, and completeness. The features of good performance indicators are content validity, reproducibility, acceptability, feasibility, reliability, sensitivity, and predictive validity.[4]

Oman is 1 of the 22 countries in the EMR of the World Health Organization (WHO). It is located in the south-eastern corner of the Arabian Peninsula with a coast that extends 3165 km from the Strait of Hormuz. Oman's borders include Yemen to the south, and the Kingdom of Saudi Arabia and United Arab Emirates to the west (Figure 1).

In Oman, little is known about the performance of PHC, particularly in the service delivery domains, that are indispensable to its strength, but frequently not well measured. In addition, in that respect, there is a lack of published works describing the performance of healthcare delivery in PHC in Oman. In this work, we are evaluating the current performance of PHC service by using KPIs to identify the potential challenges that need to be confronted, highlight the valuable lessons learnt and propose steps towards further PHC improvement.

Methodology

Study design: We conducted a cross-sectional observational study in 6 out of 11 governorates in Oman during the period of June 2017 and June 2018.

Study sites and sample size: There is a total of 239 PHC centers distributed across the 11 governates (provinces) in Oman. The following criteria were used for selecting the facilities: The PHC must have a computerized system (ALshifa 3 plus), have specialized clinics like diabetes and hypertension, the management must be willing to participate and provide the information and the PHC center and have laboratory services available in the health centers. We then stratified the facilities in the 6 governates that fulfilled the inclusion criteria into urban and rural centers. Two primary health care centers (1 urban and 1 rural) were randomly chosen that fulfilled the inclusion criteria from each governorate.
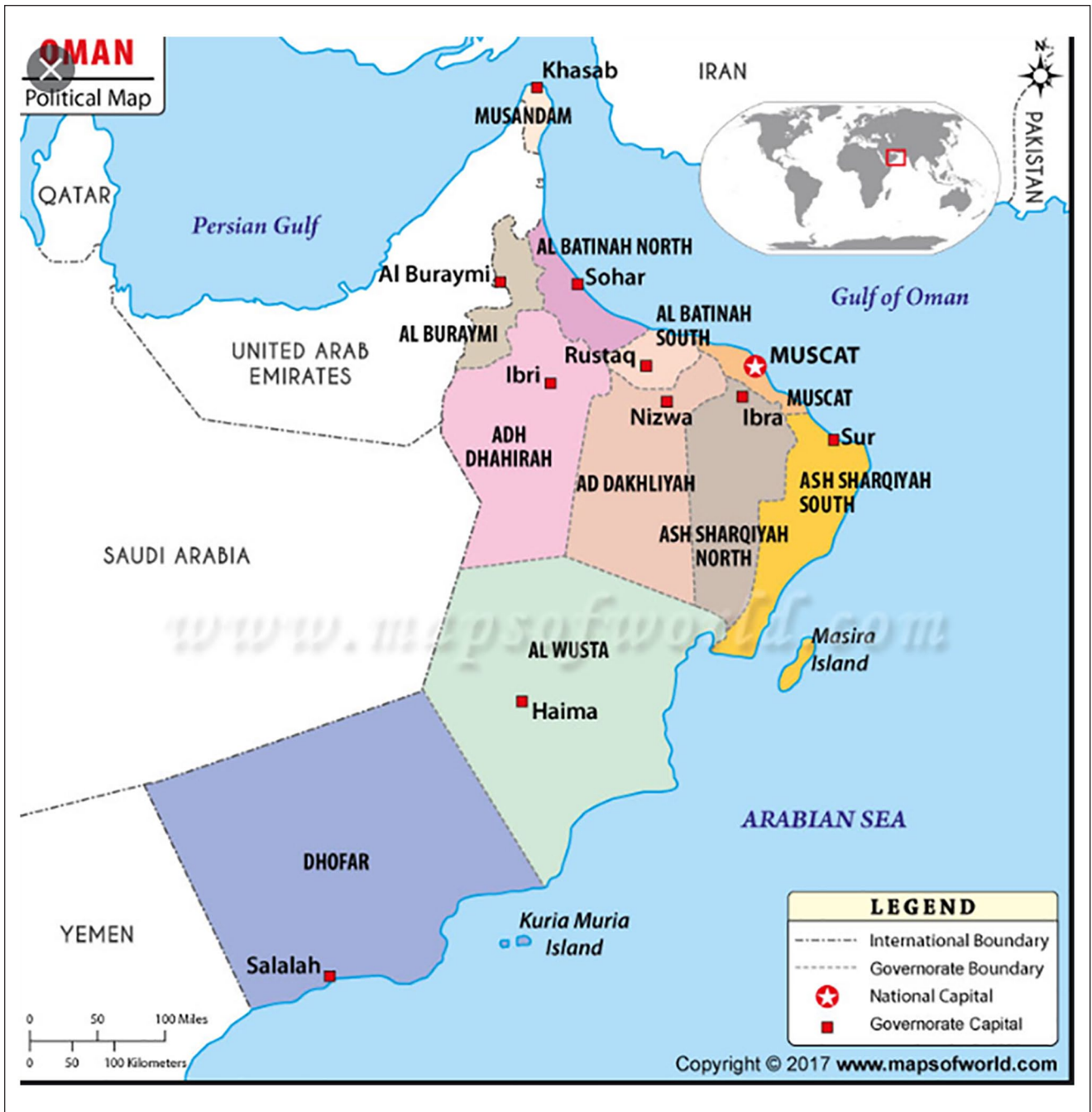
Figure 1. Map of Oman.

***Data Collection*:** The KPIs, data were obtained from the computerized medical records of the PHC by a trained PHC medical professional using a data collection sheet set up accordingly. Two medical professionals per each PHC center were selected by the chief investigator to receive appropriate training on data collection.

We assessed KPIs covering input (workload), service delivery (clinical outcomes, and safety, output (timeliness), outcomes (satisfaction) and system factors accessibility).[8] Each KPI was defined with structured questions that targeted to carefully extract data on events and indicators used to measure KPIs (Table 1).[5] Each indicator was scored between 1 and 6 with 6 indicating maximum performance. The indicators were derived from the PHC performance framework of the Primary Health Care Performance Initiative (PHCPI).[8] The Ministry of Health assembled a local team of PHC experts and an independent epidemiologist to identify locally relevant indicators

Table 1. Study Key Performance Indicator Areas, Definitions and Grading Scale (Score) Used, Oman.

Key Performance Indicator	Definition	How to Calculate the Definition	Score					
			1	2	3	4	5	6
Accessibility	Distance to nearby hospital	Calculation of distance between the primary health center and nearest secondary or tertiary hospital in kilometers	>50 km	50-40 km	20-<40 km	15-<20 Km	10-<15 km	<10 km
Workload	Availability of community nursing services	Health facility having community care	No		Not applicable			Yes
	Total catchment area population	Population in the catchment area	>30000	>25000-30000	>20000-25000	>15000-20000	>10000-15000	10000
	Average number of patient per GP clinic per day	Check how many GPs clinics in all shifts were running on a daily basis during working days October-December 2016	>70 cases per GP	>60-70 cases per GP	>50-60 cases per GP	>40-50 cases per GP	>30-40 cases per GP	30 cases per GP
	Average number of patient per dental surgeon clinic per day	Check how many dental clinics in all shifts were running on a daily basis during working days October-December 2016	>35-40 cases per dentist	>30-35 cases per dentist	>25-30 cases per dentist	>20-25 cases per dentist	>15-20 cases per dentist	15 cases per dentist
	Number of private clinics, under supervision of health center	Total number of private clinics, under supervision of the health center during the audit period	<30 clinic	25-<30 clinic	20-<25 clinic	15-<20 clinic	10-<15 clinic	5-<10 clinic
	Number of schools under PHC	Total number of governorate schools under supervision of the health center till end of 2016	>12	11-12	9-10	7-8	4-6	<4
	Number of deliveries	Total number of deliveries in a health center till end of 2016	≥20/year	15-<20/year	10-<15/year	5-<10/year	<5/year	0
	Elderly screening	Total number of cases seen as elderly screening during October-December 2016	>25	21-25	16-20	11-15	5-10	<5
	Nursing procedures	Total number of nursing procedure during October-December 2016	≥3000	2500-<3000	2000-<2500	1500-<2000	1000-<1500	<1000/m
	Number of patient seen by dietician	The number of patients seen by dietician during October-December 2016	<60	60-<70	70-<80	80-<90	90-<100	≥100
	Number of clients seen by health educator at PHC center face to face	No. of client seen by health educator at PHC center face to face during October-December 2016	<60	60-<70	70-<80	80-<90	90-<100	≥100
Safety	The percentage of the health facility staff immunized for Hepatitis B (3 doses)	The percentage of all health workers in the facility immunized against hepatitis	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of mild adverse events reported after vaccination	Percentage of adverse events reported after vaccination during October-December 2016	≥25%	20%-<25%	15%-<20%	10%-<15%	5%-<10%	<5%
Outcome	Percentage of DM with BMI > 24.9	Percentage of DM with BMI > 24.9 in the register till 31 December 2016	>80%	>70%-80%	>60%-70%	>40%-60%	>20%-40%	≤20%
	Percentage of DM with hyperlipidemia	Percentage of DM with dyslipidemia in the register 31 December 2016	>80%	>70%-80%	>60%-70%	>40%-60%	>20%-40%	≤20%
	Percentage of DM with eGFR < 60	Percentage of DM with latest eGFR < 60 by MDRD in the register till 31 December 2016	>50%	>40%-50%	>30%-40%	>20%-30%	>10%-20%	≤10%
	Percentage of DM their LFT checked annually	Percentage of DM their LFT checked during 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of DM their lipid checked annually	Percentage of DM their lipid checked during 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of DM their HBA1c checked at least once per year	Percentage of DM their HBA1c checked at least once during 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of DM referred to ophthalmology	Percentage of DM referred to ophthalmology during 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of T2DM their ACR checked annually	Percentage of T2DM their ACR (microalbumiuria) checked during 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of hypertensive patients with BMI > 24.9	Percentage of hypertensive patients with BMI > 24.9 in the register till 31 December 2016	>80%	>70%-80%	>60%-70%	>40%-60%	>20%-40%	≤20%
	Percentage of Hypertension with eGFR < 60	Percentage of Hypertension with eGFR < 60 by MDRD in the register till 31 December 2016	>50%	>40%-50%	>30%-40%	>20%-30%	>10%-20%	≤10%
	Percentage of hypertension their ACR checked annually	Percentage of hypertension their ACR (micro-albumiuria) checked during 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of hypertensive patients, their FBS checked annually	Percentage of hypertension patients, their FBS checked during 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	The percentage of children born 24 months back completed their immunization	The percentage of children born 24 months (Kids born Jan-February/2014) completed their immunization	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-99%	100%
	Percentage of 2 months old babies with recorded TSH results in the pink card	Percentage of 2 months old babies with recorded TSH results in the pink card during October -December 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-99%	100%
	Percentage of 1st trimester booking in last 12 months	Percentage of 1st trimester booking during October-December 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of 1st trimester booking with Hemoglobin < 10 received iron supplements	Percentage of 1st trimester booking with Hemoglobin < 10 received iron supplements during October-December 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of pregnancies with gestational diabetes	Percentage of pregnancies with gestational diabetes during October-December 2016	≥50%	40%-<50%	30%-<40%	20%-<30%	10%-<20%	<10%
	Percentage of reported referral investigations	Percentage of receiving the results of referral investigations during the audit period	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-99%	100%

Table 1. (continued)

Key Performance Indicator	Definition	How to Calculate the Definition	Score					
			1	2	3	4	5	6
	Percentage of DM their latest HBA1Cc < 7	Percentage of DM their latest HBA1c < 7	≤20%	>20%-30%	>30%-40%	>40%-50%	>50%-60%	>60%
	Percentage of DM their latest HBA1c ≥ 9	Percentage of DM their latest HBA1c ≥ 9	≥50%	40-<50%	30-<40%	20-<30%	10-<20%	<10%
	Percentage of T2DM with proteinuria on ACEI or ARBs	Percentage of T2DM with diabetic nephropathy on ACEI or ARBs	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of hypertension with proteinuria on ACEI or ARBs	Percentage of hypertension with nephropathy on ACEI or ARBs	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%-100%
	Percentage of out referral from total outpatient	Percentage of out referral from total outpatient during October-December 2016	≥25%	20%-<25%	15%-<20%	10%-<15%	5%-<10%	<5%
	Percentage of laboratory investigations requested	Percentage of laboratory investigations requested during October-December 2016	>50% from total outpatient	>45-50% from total outpatient	>40-45% from total outpatient	>35-40% from total OPD	30%-35% from total OPD	<30% from total OPD
	Percentage of plain X-ray from total outpatient	Percentage of plain X-ray from total outpatient during October-December 2016	>5%	4.5%-<5%	4%-<4.5%	3.5%-<4%	3%-<3.5%	<3% of OPD
	Percentage of X-rays send for reporting	Percentage of plain X-rays send for reporting from total X-rays requested during October-December 2016	>90%-100%	>80%-90%	>70%-80%	>60%-70%	>50%-60%	≤50%
	The percentage of pregnant screened for HIV	The percentage of pregnant screened for HIV during October-December 2016	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-99%	100%
	Percentage of women attended at least one visit during the 6 weeks postnatal clinic	Percentage of delivering women attended at least one postnatal clinic visit during October-December 2016	≤40%	>40%-50%	>50%-60%	>60%-70%	>70%-80%	>80%
	Percentage of women accepted birth spacing method from total postnatal clinic	Percentage of women accepted birth spacing method from total 6 weeks post natal clinic during the audit period	≤40%	>40%-50%	>50%-60%	>60%-70%	>70%-80%	>80%
	Percentage of antibiotic containing prescriptions in general clinic	Percentage of antibiotic containing prescriptions in general clinic during October-December 2016	>40%	>35%-40%	>30%-35%	>25%-30%	>20%-25%	≤20%
	Percentage of NSAIDs containing prescriptions in general clinic	percentage of NSAIDs containing prescriptions in general clinic during October-December 2016	>40%	>35-40%	>30-35%	>25-30%	>20-25%	≤20%
	Percentage of under stock medicines due to staff error	Percentage of under stock medicines due to staff error during October-December 2016	>50%	41%-50%	31%-40%	21%-30%	11%-20%	≤10%
	Percentage of overstock medicines due to staff error	Percentage of overstock medicines due to staff error during October-December 2016	>50%	41%-50%	31%-40%	21%-30%	11%-20%	≤10%
	Percentage of expired medicines due to staff error	Percentage of expired medicines due to staff error during October-December 2016	>50%	41%-50%	31%-40%	21%-30%	11%-20%	≤10%
	Tuberculosis surveillance	Percentage of Tuberculosis suspect patients completed their 3 AFB samples during October-December 2016	≤40%	>40%-50%	>50%-60%	>60%-70%	>70%-80%	>80%
Timeliness	Average time taking from calling an ambulance to reaching PHC center	Time from calling an ambulance to reaching PHC center during October-December 2016	>30 minutes	26-30 minutes	21-25 minutes	16-20 minutes	10-15 minutes	<10 minutes
Satisfaction	Patients agreeing with the statement "I was treated with dignity and respect"	Patient satisfaction rate	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%
	"I am satisfied with the care I give to patients/service users"	Staff satisfaction rate with the care they deliver	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%
	I am satisfied to work in this place	Staff satisfaction rate at the working place	≤50%	>50%-60%	>60%-70%	>70%-80%	>80%-90%	>90%

Abbreviations: "0": Not applicable; ACEI: Angiotensin-converting-enzyme inhibitors; ACR: Albumin to Creatinine ratio; AFB: Acid fast bacilli; ARBs: Angiotensin II receptor blockers; BMI: Body mass index; DM: Diabetes mellitus; FBS: Fasting blood sugar; GFR: estimated glomerular filtration rate; GP: General practitioner; HB A1c: Hemoglobin A1c; LDL: Low-density lipoprotein; LFT: Liver function test; MDRD: Modification of Diet in Renal Disease; N/A: Not Applicable; NSAIDs: Non-steroidal Anti-inflammatory Drugs; PHC: Primary Health care; T2D: Type 2 diabetes.

from the PHCPI vital sign measures that could be easily measured and scaled up.

A total of 52 indicators was measured across the 6 domains for a total score of 312. During data collection a number of indicators were not applicable to some of the facilities, and these indicators were not scored for the respective facility reducing the overall score calculation. The score for each group was calculated by summing the individual lots and then splitting up by the number of parameters to generate an average mark of each parameter. The data collected were analysed and the average was calculated by the KPIs and each PHCs center.

Indicators measured: Accessibility was measured in terms of distance to health facilities and the availability of community nursing. Timeliness was measured using a single indicator of average time taking from calling an ambulance to reaching health facility. Safety was assessed using 2 key indicator percentage of the health facility staff immunized for Hepatitis B (3 doses) and percentage of adverse effects reported after vaccination. Satisfaction was assessed using 3 indiactors- 1 from a patients perspective (Treated with dignity and respect) and 2 from a serive provider perspective (satisfaction with care provided and satisfaction with place of work). Clinical outcomes were assessed by measuring 25 patient outcome indicators from a wide variety of conditions (Table 2).

Statistical analysis: Numbers and comparable percentages were applied to adequately describe categorical data. Measures of central tendency namely (Mean [± standard deviation; SD]) were used to analyse numerical data.

Ethics approval: This study was approved by the internal institutional review board and adheres to the Declaration of Helsinki.

Results

Overall Performance

During the study period, a grand total of 6 key KPIs indicators were assessed in 12 PHC centers. Data were collected from 12 centers, however, 2 PHC centers Ansab and Manah more than 50% of the information was missing as they were not applicable and excluded from the analysis. We initially aimed to collect 52 KPIs, but during data collection a number of indicators were not applicable to some of the PHC centers. The number of not applicable indicators ranged from 6 in Buldan to 12 in Akdar. This accounts for the different denominators in the total scores. The average overall performance scores were normally distributed across the ten PHC centers was 174.5 (SD: 9.80) or 67.01%. The lowest percentage score was obtained by Al Qabil (61.35%) with the highest score being at Wadi kabir center (70.54%) (Table 3).

Performance Against Different Components

Each PHC centers exhibited variation in grading. The mean score across all KPIs was 3.84 (SD:0.94). Akdar (4.31), Awabi (4.07), Wadi kabir (4.04), and Yunqul (4.02) were the 4 PHC centers whose mean scores were more than 70% of the total score (Table 2). Of the 6 KPI components, the mean scores were: safety (4.85), satisfaction (4.67), timeliness (4.44) and accessibility (4.31) had the highest performance scores, whilst workload (4.15) and outcomes (3.75) lagged behind (Figure 2, Table 3).

Nine of the ten PHC centers scored a mean of 83.33% (5/6) with respect to safety, with only 1 center Wadi kabir scores below this threshold at 66.67% (4/6). Only 1 PHC center Bidiyah (3.67/6) scored below 75% (≥4.5/6) for satisfaction. Seven PHC centers (70%) scored in excess of 75% (≥4.5/6) in terms of accessibility of services. Fifty percent of the PHC enters scored in excess of 75% (≥4.5/6) with respect to timeliness. Bildan Al Awamir and Awabi centers performed the lowest with a score of 50% (3/6) and 33% (2/6) respectively dragging the overall average for accessibility down. With respect to workload and outcomes, none of the PHC centers were able to attain a threshold of 75% and above (Table 4).

Performance Against Individual Indicators

Input

Accessibility. At 44% (4/9) of PHC centers the nearest secondary hospital for referral was within a 15 km distance, whilst for 1 facility the enarest hospital was withon a 20 km distance. At 2 PHC centers Al Awabi and Bildan Al Awamir the distances were in excess of 40 km. Data was not available for 2 facilities.

Eight PHC centers reported availability of community health nursing, whilst data was missing from 2 facilities.

Process

Workload. Amongst the factors that influence the workload is that of a defined catchment population. Fifty-five percent of PHC centers (5/9) have a catchment population between 10 000 and 15 000 as per the Ministry of Health (MOH) standard. One facility has a catchment population in excess of 30 000.

General practitioners and professional nurse at clinics are utilized to consult patients efficiently. This will have the potential to reduce hospital referrals. At 55% of PHC centers (5/9) general practitioners (GPs) consulted between 30 and 40 patients (average patient consultation 480/40 = 12 minutes per patient), whilst the other 50% of the centers consulted more than 60 patients per day (480/60 = 8 minutes per patient). More than 25 patients on average per day are consulted by the dental surgeon visit at Al Motqa clinic. Seventy-five percent (6/8) of the PHC has <8 schools under

Table 2. Performance Score by Indicator for Each Primary Health Care (PHC) Center, Oman.

Indicator	Component	PHC Center										Mean Score
		Akdhar	Al Mutqa	Al Qabil	Al Awabi	Bidiyah	Bidan Al awamir	Ibra	Rustaq	Wadi kabir	Yunqul	
Distance to nearby hospital	Accessibility	5	2	4	2	0	1	5	5	5	0	3.63
Availability of community nursing services	Accessibility	N/A	5	5	N/A	5	5	5	5	5	5	5
Total catchment area population	Workload	4	3	4	4	N/A	4	N/A	1	N/A	4	3.43
Average number of patient per GP clinic per day	Workload	3	5	4	4	N/A	2	2	4	3	5	3.56
Average number of patient per dental surgeon clinic per day	Workload	5	3	5	5	4	4	5	4	5	4	4.4
Number of private clinics under supervision of PHC center	Workload	5	5	5	5	5	4	5	5	5	5	5
Number of schools under PHC center	Workload	5	4	4	4	2	4	N/A	N/A	3	4	3.75
Number of deliveries	Workload	5	5	5	4	5	5	5	5	5	5	4.9
Elderly screening	Workload	2	4	4	4	N/A	5	5	N/A	2	N/A	3.71
Nursing procedures	Workload	N/A	N/A	4	1	N/A	1	N/A	N/A	N/A	2	2
Number of patient seen by dietician	Workload	N/A	N/A	5	3	N/A	5	N/A	5	5	5	4.71
No. of client seen by health educator at PHC center face to face	Workload	5	N/A	5	N/A	5	1	5	5	N/A	5	4.5
Overall performance score		177	173	173	183	159	179	171	159	182	189	3.8
Percentage		73.75	64.07	61.35	70.93	61.63%	64.86	66.28	67.95	70.54	70.00	67.01
Percentage of hypertension with eGFR < 60	Outcome	5	5	5	5	5	4	5	5	3	4	4.6
Percentage of hypertension their ACR checked annually	Outcome	3	3	4	5	1	2	3	N/A	N/A	5	3.13
Percentage of hypertensive patient their fasting blood sugar checked annually	Outcome	4	4	4	5	4	2	3	1	5	5	3.7
Percentage of children born 24months back completed their immunization	Outcome	5	4	5	5	4	5	5	5	5	5	4.8
Percentage of two months old babies with recorded TSH results in the pink card	Outcome	5	4	5	3	3	2	4	4	4	5	3.9
Percentage of first trimester booking in last 12months	Outcome	2	5	3	4	2	3	3	4	3	1	3
Percentage of first trimester booking with hemoglobin < 10 received iron supplements	Outcome	N/A	5	N/A	5	5	5	5	5	2	5	4.63
Percentage of pregnancies with gestational diabetes	Outcome	3	3	4	5	4	N/A	3	2	5	3	3.56
Percentage of reported referral investigations	Outcome	5	5	5	4	4	4	5	4	5	4	4.5
Percentage of DM their latest HBA1c < 7	Outcome	2	3	1	3	2	3	N/A	2	2	4	2.22
Percentage of DM their latest HBA1c ≥ 9	Outcome	2	2	2	3	2	2	4	2	4	4	2.67
Percentage of T2DM with proteinuria on ACEI or ARBS	Outcome	5	5	2	5	5	5	4	3	N/A	5	3.88
Percentage of hypertension with proteinuria on ACEI or ARBS	Outcome	5	4	N/A	N/A	N/A	N/A	5	4	N/A	5	4.67
Percentage of out referral from total outpatient	Outcome	3	1	3	5	4	4	4	4	3	4	3.5
Percentage of laboratory investigations requested	Outcome	N/A	3	N/A	5	3	3	3	N/A	1	0	3
Percentage of plain X-ray from total outpatient	Outcome	5	N/A	N/A	5	5	5	5	N/A	4	4	4
Percentage of X-rays send for reporting	Outcome	N/A	5	N/A	N/A	N/A	N/A	N/A	N/A	5	N/A	2.5
Percentage of pregnant screened for HIV	Outcome	5	5	5	5	5	5	4	5	5	5	4.4
Percentage of woman attended at least one visit during 6weeks post natal care	Outcome	3	5	5	5	1	1	3	3	5	2	3.3
Percentage of woman accepted birth spacing method from total post natal care	Outcome	N/A	N/A	2	N/A	N/A	1	N/A	N/A	N/A	N/A	1.5
Percentage of antibiotic containing prescriptions in general clinic	Outcome	4	1	5	5	4	4	4	3	5	4	3.9
Percentage of NSAIDs containing prescriptions in general clinic	Outcome	4	N/A	N/A	N/A	5	4	N/A	5	2	5	3.33
Percentage of under stock medicines due to staff error	Outcome	5	1	3	5	N/A	5	5	N/A	5	5	3.78
Percentage of over stock medicines due to staff error	Outcome	5	2	4	5	N/A	5	4	N/A	5	5	3.89
Percentage of expired medicines due to staff error	Outcome	5	5	5	5	N/A	5	5	0	5	4	4.22
Percentage of Tuberculosis suspect patients completed their 3 AFB samples during October–December 2016	Outcome	N/A	N/A	2	1	1	N/A	N/A	N/A	N/A	N/A	1.5
Average time taking from calling ambulance to reaching PHC center	Timeliness	3	5	N/A	4	5	3	3	4	5	4	4.44
Patients agreeing with the statement "I was treated with dignity and respect"	Satisfaction	5	4	5	5	4	5	5	4	5	4	4.8
"I am satisfied with the care I give to patients/service users"	Satisfaction	5	5	5	5	5	5	4	5	5	5	4.8
I am satisfied to work in this place	Satisfaction	5	5	4	4	3	5	5	4	4	4	4.4
Percentage of health facility staff immunized for Hepatitis B (3 doses)	Safety	N/A	5	N/A	N/A	N/A	N/A	N/A	5	3	N/A	4.33
Percentage of mild adverse events reported after vaccination	Safety	5	5	5	5	5	5	5	5	5	5	5
Overall performance score		177	173	173	183	159	179	171	159	182	189	3.80
Percentage		73.8	64.1	61.4	61.6	61.6	64.9	66.3	68.0	70.5	70.00	67.0

Abbreviations: "0": Not applicable; ACEI: Angiotensin-converting-enzyme inhibitors; ACR: Albumin to Creatinine ratio; AFB: Acid fast bacilli; ARBs: Angiotensin II receptor blockers; BMI: Body mass index; DM: Diabetes mellitus; FBS: Fasting blood sugar; GFR: estimated glomerular filtration rate; GP: General practitioner; HB A1c: Hemoglobin A1c; LDL: Low-density lipoprotein; LFT: Liver function test; MDRD: Modification of Diet in Renal Disease; N/A: Not Applicable; NSAIDs: Non-steroidal Anti-inflammatory Drugs; PHC: Primary Health care; T2D: Type 2 diabetes.

Table 3. Frequency Distribution and Mean Overall Key Performance Across all Domains per Primary Health Care centers, Oman.

PHC Center	Total Score	Percentage	Mean Score
Akdhar	177	73.75%	4.21
Al Motqa	173	64.07%	3.68
Al Qabil	173	61.35%	3.53
Al Awabi	183	70.93%	4.07
Bidiyah	159	61.63%	3.53
BildanAl Awamir	179	64.86%	3.73
Ibra	171	66.28%	3.80
Rustaq	159	67.95%	3.88
Wadi kabir	182	70.54%	4.04
Yunqul	189	70.00%	4.02
Mean (SD)	174.5 (9,80)	67.01%	3.84
Median (IQR)	175 (171-181)	67.80%	3.90

Abbreviation: IQR: Interquartile range.
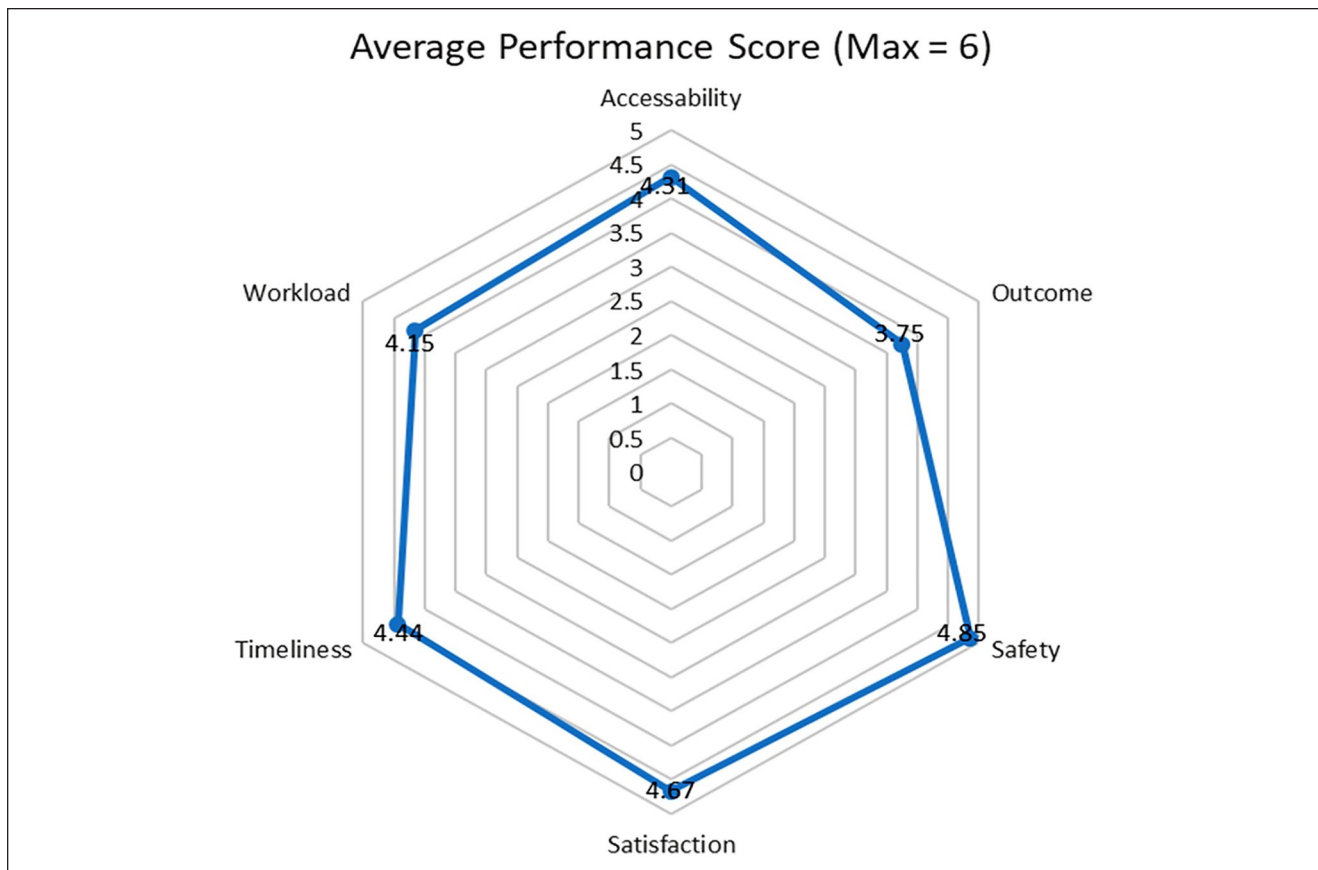
Figure 2. Mean performance scores by Key Performance Indicators (KPIs) components, Oman.

their supervision, whilst the Bidiah clinic has eleven schools under its supervision. Two facilities (Akbar and Wadi kabir) conducted in excess of twenty elderly screenings during the 3 month review period. At 1 facility (Bildan Al awamir), <60 patients received direct face to face health education.

Timeliness. The current performance review shows that, in 50% of the PHC centers the response time for the ambulance was between 10 and 15 minutes. At 3 PHC centers the response time was between 16 and 20 minutes, whilst at a further Akdhar PHC center was between 21 and 25 minutes.

Table 4. Mean Performance Score of Key Performance Indicators (KPIs) by Primary Health Care (PHC) centers, Oman.

PHC Center	KPIs					
	Accessibility	Workload	Outcome	Timeliness	Satisfaction	Safety
Akdhar	5	4.25	4.11	3	5	5
Al Mutqa	3.5	4.14	3.38	5	4.67	5
Al Qabil	4.5	4.5	3.19	n/a	5	5
Al Awabi	2	3.9	4.1	4	4.67	5
Bidiyah	5	4.2	3.61	5	3.67	5
Bildan Al Awamir	3	3.6	3.73	5	5	5
Ibra	5	4.57	3.5	5	4.67	5
Rustaq	5	4.14	3.68	4	4.67	5
Wadi kabir	5	4	4.03	5	4.67	4
Yunqul	5	4.33	3.94	4	4.67	5
Mean score	4.31	4.15	3.75	4.44	4.67	4.85

Safety. At 2 of the 3 PHC centers (Al Motqa and Rustaq) that reported that 80% to 90% of staff were fully immunized, whilst at the remaining facility (Wadi kabir) only 60% to 70% of the staff were fully immunized.

Referable to the legislative requirement all 10 facilities reported on adverse events following immunization (AEFI). Less than 10% of vaccination administered were associated with mild AEFI that occurred and were reported between October and December 2016.

Outcome. Thirty-five indicators were used to measure and review the performance in terms of outcome. A number of outcome indicators performed on the lower scoring scale. Two PHC centers (Al Qabil and Bidiyah) had cases of Tuberculosis during the study period. Within these centers <50% of the TB suspect patients completed their 3 Acid fast bacillus (AFB) samples during October-December 2016.

Data reported from 2 PHC centers (Al Qabil and Bilda Al awamir) indicated that <50% of females accepted birth spacing methods at 6 week post-natal care visit.

Across all facilities blood glucose control was unsatisfactory with 8/9 PHC centers reporting that a maximum of 50% of patients latest Hemoglobin A1c (HbA1c) levels were less than 7 and 5 PHC centers indicating that up to 50% of patients HbA1c levels was greater than 7.

Furthermore, at 5 of the 9 PHC centers (Akdhar, Al Awabi, Bidiyah, Rustaq and Yanqul) more than 60% of the diabetes patients had hyperlipidaemia.

Another outcome of particular concern is that of body mass index. At 7 (Al Mutqa, Al Awabi, Bidiyah, Bilad Al awamir, Ibra, Wadi kabir and Yanqul) of the 9 PHC centers up to 70% of patients with diabetes and hypertensive patients had a body mass index > 24.9.

First trimester bookings were <60% at 5 (Akdhar, Al Mutqa, Ibra, Rustaq and Yunqul) of the 9 PHC centers. Gestational diabetes was reported at between in excess of 30% across 50% of the PHC centers.

At 6 PHC centers (Akdhar, Bidiyah, Bildan Al awamir, Wadi kabir and Yanqul) out of 9 <60% of the women attended at least 1 visit during the 6 weeks postnatal care.

Satisfaction and Responsiveness. Three indicators (two from a patient perspective and 1 from the health professional's perspective) were used to assess performance in terms of responsiveness or satisfaction. Across all 3 indicators except Bidiyah, where 60% to 70% of staff indicated satisfaction at their workplace. Across all ten facilities more than 75% of patients were satisfied with services offered in terms of being treated with dignity and courtesy by staff, and 90% of the staff were also satisfied with their employment environment and work. The mean score across all ten facilities was 4.85.

Discussion

The key performance indicators are useful measures to assess the performance of PHC's delivery system as it's reflect the true environment in the PHC system and provide efficiency against benchmark values and/or international standards.[5] In addition, health systems based on high performing good KPIs at PHC are able to achieve better short and long health and clinical outcomes of the community.[5]

The scoring patterns obtained in various PHC centers of Oman exhibited a considerable variation across the various domains that were measured. The findings indicate that safety (4.85); satisfaction (4.67); timeliness (4.44) and accessibility (4.31) had the highest performance scores, whilst workload (4.15) and outcomes (3.75) lagged behind in performance.

Accessibility

Accessibility to healthcare facilities is undoubtedly a fundamental right and important facilitator of the efficient health

system. The distances to the PHC center and the travel time have an association with the adverse health outcome of the patient. As the distance and travel time increase, the health outcome worsens.[4,5,7,9] Hence, these factors have to be considered while selecting the location of healthcare facilities. Although there is no consensus on the optimal distance to a hospital, it is usually indicated that the distance between a patients home and a larger hospital should not exceed 25 to35 km.[10] As highlighted in our study the majority of facilities were within 20 km of the nearest hospital, with 2 facilities from our current study facilities were in excess of 40 kilometre distance to the nearest hospital. This is in contrast to the South West Region of the United Kingdom where the median distance to a district hospital was just <12 km (IQR 5.4–19.0), with a maximum of 50 km, corresponding to an estimated 13 and 48 minutes drive-time.[11] Similarly in Botosani county Romania the distance travelled by a patient to the nearest hospital varies between 10 km and 50 km, with patients from the South East of the county travel a longer distance to the nearest hospital.[12] The most probably reason for the 2 facilities in our study being a far distance from the PHC facilities is that these facilities were built on community demand rather than geospatial planning.

All 8 facilities that reported on this measure were implementing community based nursing. A similar experienced was observed in other countries eluded as the health care system delivery shifts from hospital to community. The role of community-based nursing interventions has shown to improve the individual and outcomes.[13] In Oman, as the expanding prevalence of chronic diseases and the requirement to provide integrated care with the patients taking responsibility for their own wellness requires the establishment of a community nursing platform.

Workload

Various studies show the quality of care is inversely related to the workload of healthcare professionals.[14,15] Amongst the factors that influences the work load is that of a defined catchment population. In our current review 50% of PHC centers shave a catchment population between 10 000 and 15 000 as per the Ministry of Health (MOH) standard. One facility has a catchment population in excess of 30 000. The other 50% with catchment are exceeds 30 000 population, these areas experienced a massive growth of the population recently.

General practitioners and professional nurse at clinics are utilized to consult patients efficiently. This will have the potential to reduce hospital referrals. The current workload calculations indicate that general practitioners consult patients on average between 8 and 12 minutes.

The average length of consultation time is used as a quality indicator by World Health Organization (WHO) and the international network for the rational use of drugs

(INRUD).[16] The consultation time varies tremendously from country to country and usually, there is a marked difference in the consultation time in government and the private sector within the country.[17-19]

Our study revealed that 50% of patients received 8 minutes of consultation time with their physician. The average consultation time is in keeping with findings from a systematic review from data available for 67 different countries that average consultation time in primary care in more than 50% of the countries was <10 minute.[1] Short consultations are likely to adversely affect patient care and the workload and stress of the consulting physician,[1] simultaneously drive polypharmacy, overuse of antibiotics and poor communication with patients.[2] Longer consultations improve health promotion, patient enablement and the quality of record keeping, lead to a more accurate diagnosis of mental health problems and that time pressures can be a major barrier to treating depression[2] and longer consultations lead to an improved quality of life and patient enablement for patients with multi-morbidity.[3] Provision of a sufficient number of qualified family physicians in each PHC center as well as increasing the number of primary care physicians is likely to help the situation to improve consultation times.

Outcome

Assessment of the-overall-pathway of risk factors management of chronic diseases like diabetes, provide a glimpse of patient management. Various studies showed that in people with diabetes if risk factors were tested (ie, LDL and cholesterol) and are checked once yearly, there will be a time lag in the optimal management of these parameters.[20] The current study indicates that the facilities perform satisfactorily in terms of process indicators by following clinical protocols. However, a major area of concern is that 60% of diabetes patients also have obesity, hyperlipidaemia, and poor blood glucose control. Furthermore, 70% of patients with DM and hypertensive patients in 7 centers have a BMI > 24.9 .This requires an integration of a curative and health promotion approach and moving towards a continuity of care approach that emphasizes patients taking responsibility for their own well-being.

Improved maternally health outcomes are the fundamental aim of PHC services.[21,22] To get a comprehensive picture of the quality and safety of antenatal care, we must measure the healthcare process which ultimately improves the outcome. Assessing the quality and frequency of antenatal care visits remains the most substantial factor which will help improve the maternal and child health outcome.[23]

Our study yielded early antenatal booking is not uniform across the study clinics. The first trimester bookings were <60% in 5 of the 9 PHC centers. In addition, 6 out of 9 <60% of the women attended at least 1 visit during the

6 weeks postnatal care. The current course of antenatal visits is not in line with MOH guideline. The percentage of expectant women favor receiving 4 or more antenatal care visits is considered an adequate indicator of antenatal care by the millennium development goal 5 and the commission for initiation and accountability for women and child health.[17,18] Hence, these centers have to advocate that pregnant women to adhere to the antenatal visiting schedule.

Birth spacing is another important factor related to women's health and in the current review this is not optimal. Inadequate intake of birth spacing methods during postnatal care visits may be attributed to due to potential cultural barriers and facility specific factors that included insufficient focus on wellness education. Henceforth, a need to establish a rigorous follow-up system to identify the ground behind the refusal.

Infectious diseases are the most important primary cause of morbidity and mortality in children, and immunization is 1 of the most effective means of preventing morbidity and mortality from vaccine-preventable infectious diseases.[20] Routine immunization is part of the government health policy and it is provided free of cost, for all citizens in the country. The immunization coverage across all the facilities is indicative of the implementation of this policy.

Only 2 PHC centers (Al Qabil and Bidiyah) reported cases of Tuberculosis during the study period . Within these centers <50% of the TB suspect patients completed their 3 Acid fast bacillus (AFB) samples during October-December 2016. The low performance is mainly attributed to inefficient supervision and monitoring system which needs to be strengthened at governorate level. In addition, screening for TB should be integrated into routine clinical care.

Timeliness

Ambulance services are an essential supportive component for health services and provide a transport mechanism to hospital facilities for patients with a life-threatening. Two PHC centers Al Awabi and Buldan, the distances were in excess of 40 km from secondary care. To shortening the timing, the PHC aims to access ambulance services with 8 minutes of requesting [23] which is still an aspiration at most of the current facilities. The value of ambulance response time as a key performance indicator is questioned in various studies.[24]

Satisfaction

Patient satisfaction is an important parameter measuring the quality of care offered in healthcare.[25] The job satisfaction of healthcare professionals is also another important parameter, which influences productivity, quality, and personal dedication towards work and it also influences the

healthcare cost.[23] Both from a patient perspective and health provider perspective more than 95% were satisfied with services offered, an being treated with dignity as well as staff were well satisfied with their workplace. These findings concur with the others regarding the health workers satisfaction.[26]

Safety

Globally, an estimated 5.9% or an 66 000 healthcare workers (HCWs) are exposed to Hepatitis B infection.[4] Further, HCW is 4 times more likely to be infected than the general adult population.[5] Exposure to patients and/or infectious materials, including bodily fluids such as blood, semen and vaginal secretions, contaminated medical supplies and equipment and contaminated environmental surfaces increase the likelihood of Hepatitis B infection.[7] The World Health Organization has recommended Hepatitis B vaccination for healthcare workers to reduce HBV transmission to and from HCWs and their patients.

Eighty to ninety percent of staff were fully immunized in PHC centers. The possible reasons that all staff were not r fully vaccinated for Hepatitis are the lack of proper protocols for monitoring and follow up of every HCWs vaccination status at PHC centers; lack of knowledge of new staff on the importance of hepatitis B vaccination; lack of pre-service orientation on the importance of vaccination; and lack of regular refresher and in-service education opportunities to ensure that HCWs have well informed and are adhering to the policy.

Across all the facilities surveyed <10% of vaccinated administered were mildly typically associated with AEFI. The occurrence of mild AEFI is common (≥1% and <10%).[27] Henceforth, the reporting AEFI from the PHC centers is within the expected rate.

This study is the very first in Oman that has interrogated PHC performance using KPI for quality and will service ti strengthen service delivery with the introduction of quality improvement plans to address the weaknesses. Although, the findings provide useful information, the study findings cannot be generalized across all the Governates of the country as data was collected from facilities in 1 Governate that has a profile that is different from other Governates. Furthermore, the findings do not reflect the overall performance of the PHC system within Oman as the selected indicators. In addition, the KPI measure internal performance of the facilities without analysing the effect of the social determinants of health on the performance of PHC facilities.

Conclusion

Performance across the KPIs exhibited a considerable variation between PHC centers. The findings of this study offered

a measure of internal strengths that need to be sustained, challenges that require quality improvement initiatives and attention to external factors such as social determinants that impact on overall performance PHC. In addition, the ambition of the Oman PHC program is to track progress on studying KPIs and to universally adopt other key performance indicators.

ORCID iD

Salah Al Awaidy https://orcid.org/0000-0001-5112-3893

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