Evaluation of Hospital Referral Notes for Pulmonary Function Tests at Tertiary Care Teaching Hospital in Oman

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ABSTRACT

Objectives: There is substantial increase in referrals for investigations at Sultan Qaboos University Hospital (SQUH). Evaluating the quality of hospital referral notes (RNs) is necessary from diagnostic, patient, and economic perspectives. RNs for pulmonary function tests (PFTs) can be considered as representative of the array of tests performed at SQUH. *Methods*: This cross-sectional study evaluated the quality of RNs based on 'completeness' for all consecutive patients referred for PFTs at SQUH over six months. Evaluation included documentation of demographic features, RNs date, priority for investigation, referral reason, pulmonary and relevant medical and smoking history for spirometry RNs, and addition of hemoglobin level for full lung functions (Full-LuFs) tests. The proportion of complete RNs was determined and analyzed separately to study association of spirometry and full-LuFs tests with source and reasons for referral. *Results:* Only 644 of 683 RNs were available for analysis. Smoking history was stated in only 3.3% of all RNs; hence, it was excluded from the analysis. RNs were complete only in 12.4% of cases for spirometry and 14.4% for full-LuFs tests. RNs for patients who primarily had pulmonary disease were proportionately incomplete than those for patients with other reasons ($p < 0.050$). There was no significant association between incompleteness of RNs and referral hospital (SQUH vs. non-SQUH) and SQUH inpatient or outpatient status implying that the overall proportion of completeness of RNs from all concerned referral locations was similar and low in both types of RNs. *Conclusions:* There is a need to improve the quality of RNs at SQUH. Referring doctors must be made aware of the importance of completeness of RNs to improve test reporting, patient management and satisfaction, and reduce financial burden on hospital exchequer.

The Ministry of Health in Oman has made many reforms to improve the efficiency of its health system.[1] These reforms are based on the understanding that improvement in efficiency must be in tandem with a simultaneous reduction in the costs incurred for running the system. One of the reforms included having documented guidelines for a proper referral system among various levels of healthcare delivery. The guidelines manual for referral was updated in 2004 after its initial introduction in 1999.[1] The referral system helps to keep a check on utilization of high-cost services in hospitals and its proper implementation includes a feed-back follow-up system aimed to improve patient care at all levels. An electronic patient referral system was introduced in Oman in 2009 after the availability of computerized database for patient management within the health system.[1]

One of the objectives of Sultan Qaboos University Hospital (SQUH) is efficient utilization of hospital resources. SQUH aspires to provide evidence-based and cost-effective health care.[2] The 2014 SQUH Annual Report mentioned that the number of existing clinical tests increased in all specialties with some specific tests showing a substantial increase.[3] Studies published independently by Omani researchers nearly a decade ago suggested strategic reforms to address overutilization and the challenge of sustaining healthcare in Oman.[4,5]

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The Department of Clinical Physiology (CPH) in SQUH offers a wide range of diagnostic services in neurophysiology, cardiology, pulmonology, sleep medicine, and other discrete tests.[3] Patients are referred to CPH from SQUH outpatient and inpatient departments, student clinics, and from other hospitals and health centers in the country.

Earlier research on a large database noted that referral of patients to pulmonary function laboratories is not properly documented.[6] Every referral note (RN) to any investigation should ideally contain definitive information regarding patients' clinical history, findings of clinical examination, and current treatment. This information helps to justify and conduct the said investigation and helps in interpretation of the pulmonary function test (PFT). For example, before conducting a PFT, it is essential to know if patient is treated with bronchodilators. The American Thoracic Society criteria[7] specifies that "the decision to avoid bronchodilators is a clinical one and is dependent on the question being asked" and "if the study is performed to diagnose an underlying lung condition, then avoiding bronchodilators is useful. If the study is carried out to determine a response to an existing therapeutic regimen, then one may choose not to withhold bronchodilator medications".

PFTs can be considered representative of a wide array of tests performed at CPH. The CPH conducts an average of 1600 PFTs every year.[3] PFTs are vital in the diagnosis and management of most respiratory conditions.

To the best of our knowledge, there are no studies conducted to evaluate the quality of RNs in health institutes in Oman. This study was conducted to ascertain the quality of RNs for PFTs based on our criteria of completeness of RNs in patients referred to CPH. The objective was to generate evidence for further action to improve efficiency in referrals for patient investigations if required.

METHODS

The RNs of all consecutive patients who came for PFTs to CPH over six months from 15 May 2016 to 15 November 2016 were studied in this cross-sectional study. The data from RNs and excel-sheets records maintained by PFT technologists was analyzed daily. The study was approved by the Medical Research and Ethics Committee in the College of Medicine and Health Science in Sultan Qaboos University.

Completeness of RNs was used to assess their quality, and the criteria were decided after scanning RNs made in the past year. Completeness of RNs for spirometry was assessed based on the mention of name, age, gender, date of ordering the test, mention of priority of the test, mention of pulmonary history, and relevant medical and smoking history by the referring doctor. For full lung functions (full-LuFs) tests, in addition to the above criteria, mention of hemoglobin (Hb) levels, which is vital, was also considered. In all the above RNs, if referral reason was the same as that stated in medical history, the RNs were considered incomplete. This is because the expected effect of given medical condition on the lung function should be mentioned in the RN. This helps in conducting and interpreting the PFTs. Mention of history of smoking on all RNs was also noted. The occupational history which is also a key factor in development of respiratory disease was not considered in our study criteria because none of the RNs in past year mentioned it.

The PFTs requested in RNs were for spirometry, spirometry with reversibility, full-LuFs tests, and full-LuFs tests with reversibility. Full-LuFs include tests for the estimation of lung volumes and diffusion capacity. Reversibility refers to repeat spirometry or full-LuFs after giving bronchodilator inhalation. For the present study, RNs for spirometry and spirometry with reversibility together were grouped as 'spirometry,' and similarly referrals for full-LuFs and full-LuFs with reversibility were grouped as 'full-LuFs'.

The RNs received were categorized as follows:
1. Based on the source of RN: 1) Referral from SQUH and non-SQUH (other hospitals e.g., Armed Forces Hospital and Ministry of Health Hospitals). 2) RNs from within SQUH were further classified into referrals from the outpatient department (OPD) and inpatients.
2. Reason/s for referral: Those who had pulmonary disease (e.g., asthma, chronic obstructive pulmonary disease, interstitial lung disease (ILD), cough, and shortness of breath (SOB)) as the main reason for referral were referred to as having primary pulmonary disease. The 'other' group included referral reasons like pre- or post-chemotherapy, pre- or post-bone marrow transplant, and pre- or post-surgery.

Table 1: Criteria of completeness of referral notes.

Criteria	Spirometry n = 249	Full-LuFs n = 395
Presence of name, age and gender	249 (100)	395 (100)
Date of order	249 (100)	395 (100)
Mention of priority	249 (100)	395 (100)
If pulmonary history is stated	236 (94.8)	268 (67.8)
If relevant medical history is stated	49 (19.7)	212 (53.7)
If smoking history is stated*	7 (2.8)	14 (3.5)
If medical history mentioned is same as reason for referral	196 (78.7)	250 (63.3)
Availability of Hb in the referral note	69 (27.7)	286 (72.4)

*Data given as n (%). *Not considered in criteria for completeness as it will result in 97% of referral notes being classified as incomplete.*
Full-LuFs: full lung functions; Hb: hemoglobin.

Data were entered in SPSS Statistics (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). Statistical analysis was done to determine proportions of the above-stated variables and study the association between completeness of RNs and referring hospitals; SQUH in- or outpatients; and the reasons for referral, separately for referrals for spirometry and those for full-LuFs using the chi-square test.

RESULTS

A total of 683 patients were referred for PFTs. Only 644 (94.3%) RNs were available for analysis as 13 RNs were not traceable. In 26 RNs the tests ordered were unclear and not analyzed. The majority of patients referred to CPH for PFTs were adults (86.3%), female (53.7%), and Omani nationals (98.4%) with a mean age of 42.0±20.0 years. The referrals were mainly from SQUH: RNs for adults from the pulmonary OPD accounted for 36.6% (236/644) referrals while 8.6% RNs were from pediatric pulmonary specialists. SQUH inpatients contributed to 13.2% RNs. The most common reason for referral was asthma (35.4%) followed by SOB (14.3%), and ILD (8.5%).

According to the criteria of completeness of RN, demographic information of the patients (name, age, and gender), date of order, and priority of referral were available in all RNs. Smoking history was stated in only 3.3% of all RNs. This was not considered in completeness criteria because otherwise 96.7% of RNs would be classified as incomplete. Pulmonary history was given in 94.8% of spirometry RNs but only 67.8% of full-LuFs. Relevant medical history was documented only in 19.7% of spirometry RNs and 53.7% of full-LuFs. In 78.7% of spirometry RNs the reason for referral given was the same as the medical history (implying incomplete RNs) and 63.3% in full-LuFs RNs. Hb value, an essential criterion for full-LuFs RNs, was present in 72.4% of RN [Table 1]. Thus, 87.6% (218/249) of RNs for spirometry were incomplete, and 85.6% (338/395) of RNs for full-LuFs were incomplete with one or more criteria [Table 1].

Among RNs for spirometry (n = 249), RNs for those having primary pulmonary diseases as the reason for referral were significantly incomplete (90.5%; *p* = 0.001) compared to secondary pulmonary reasons. The incompleteness of RNs for spirometry was not associated with referral hospital and SQUH patient location [Table 2], and the incompleteness of full-LuFs RNs was not associated with referral hospital, SQUH patient location and referral

Table 2: Completeness of spirometry referral notes across key variables.

Variables	Category	Spirometry		Total	*p*-value
		Complete n (%)	Not complete n (%)	N	
Referral hospital	SQUH	21 (11.9)	156 (88.1)	177	0.192
	Non-SQUH	10 (13.9)	62 (86.1)	72	
SQUH patient type	Outpatient	19 (11.5)	146 (88.5)	165	0.420
	Inpatient	2 (16.7)	10 (83.3)	12	
Referral reason	Primary pulmonary reasons	21 (9.5)	200 (90.5)	221	0.001
	Secondary pulmonary reasons	9 (34.6)	17 (65.4)	26	

SQUH: Sultan Qaboos University Hospital.

Table 3: Completeness of full-LuFs referral notes across key variables.

Variables	Category	Full-LuFs		Total	p-value
		Complete n (%)	Not complete n (%)		
Referral hospital	SQUH	48 (13.9)	297 (86.1)	345	0.280
	Non-SQUH	9 (18.0)	41 (82.0)	50	
SQUH patient type	Outpatient	41 (15.1)	231 (84.9)	272	0.155
	Inpatient	7 (9.6)	66 (90.4)	73	
Referral reason	Primary pulmonary reasons	40 (15.2)	223 (84.8)	263	0.370
	Secondary pulmonary reasons	17 (13.4)	110 (86.6)	127	

Full-LuFs: full lung functions; SQUH: Sultan Qaboos University Hospital.

reason [Table 3] implying that overall proportion of completeness of RNs from all concerned referral locations was similar and low in both types of RNs.

DISCUSSION

Improper documentation of RNs and communication between hospitals affects the quality and cost of health services and can mislead doctors and technologists about the patients' condition.[8] Oman's Health Vision 2050 document mentions that all health systems around the world, including Oman, are suffering from excessive cost of health care services.[1] The health system in Oman, as stated in its Vision 3 on Rationalized Expenditure, has been putting in efforts to minimize the cost and enhance the quality of health by its commitment to raise public awareness by focusing on the financial perspectives involved and thereby address the overutilization of health services.[1]

Based on the criteria of completeness to determine the quality of RNs, we found that only 12.4% to 14.4% of RNs to be complete. A miniscule number of RNs documented smoking history, which is essential while interpreting the test. If we had considered smoking as additional criteria in our analysis, then 97% of our RNs would be incomplete. RNs were incomplete irrespective of referring hospital and location (in- vs. outpatients). An incomplete RN with inadequate relevant clinical information may delay in arranging an appointment and lead to inappropriate patient examinations.[9] Patients may be rejected because of lack of information essential to conduct the test. All this affects patients' satisfaction because it is a waste of their time and travel costs, and loss of working days for patients and

their accompanying relatives. Providing the reason for referral was one of the metrics to measure the quality of health information exchange.[8] A major study in the west which evaluated consecutive tests to assess primary reasons for referral for PFT showed that the identifiable reasons for referral were found only in 83% of 24 602 test results.[6] Most referrals for PFT were ordered to follow disease progression or check current treatment response suggesting the importance of follow-up documentation of changes in lung function and also maintaining quality control of pulmonary function laboratories. Our study showed that the majority of RNs for spirometry and only two-thirds of RNs for full-LuFs had identifiable pulmonary reasons mentioned. Another study found that out of all RNs from primary public health care to specialty clinic only 6% were complete.[9]

Our PFT technicians had to put in extra effort to document Hb values in 27.7% of the patients, by searching for recent Hb value in the Hospital Information System software. We also found that, for approximately 15% of patients, the given Hb value was either wrong or older than two years. Giving details of this is beyond the scope of this paper. Incorrect or absent Hb values can cause significant misinterpretation of diffusion capacity of lungs.[10]

Our study found that the maximum incomplete RNs were for patients having pulmonary disease as the primary reason for referral, and in 26 RNs the investigation ordered was unclear and we can provide no justifiable explanation for these two findings. The only plausible reason for this lack of completeness could be the existing attitude and practice of the referring doctors that whatever they write in the RNs, the referred patient would be automatically accepted for the test. This could also be perhaps due

to the good rapport that the referring doctors have with the staff conducting PFTs. But this approach is certainly not scientific or justified. Unavailability of the proper format of RNs could also be another reason for RNs not being complete. Education of primary care doctors[11] and better interaction between specialists and referring physicians through regular meetings[12] are suggested ways to improve the quality of RNs. Simply providing guidelines may not improve referral quality.[13] One of the limitations of our study is that occupational history, which is also a key factor in the development of respiratory disease was not considered in our quality of RN study criteria due to the reason given in the methodology.

CONCLUSION

We recommend that a similar study be conducted for some other important investigations at SQUH to generate stronger evidence about the overall quality of RNs, which would help the decision-makers re-examine the existing policy of referrals. We suggest that there is a need to improve the quality of RNs for PFTs and this could be achieved by making a standard format of RN in which there are mandatory fields to provide all relevant details, without which the patient will not be accepted for the test. All referring doctors from hospitals or clinics that send their patients for PFTs in SQUH must be made aware of the importance of clinical completeness of RNs from the point of reporting of the test by the physician, patient convenience, satisfaction and care, and above all to curtail unnecessary health expenditure.

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