

The Challenge of Designing Key Performance Indicators for Academic Hospitals: Quality of Care for Patients with Ischemic Heart Disease

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ABSTRACT

Background: This study assesses whether patients with ischemic heart disease receive comparable care and achieve similar outcomes compared to the rest of patients in the department of medicine at our tertiary academic center.

Methods: This retrospective study examined the level of care received by all patients who were admitted to the Internal Medical Services at King Abdulaziz University Hospital from January 2010 through December 2012. A number of potential performance indicators were evaluated to ascertain level of care, including clinical deterioration with unplanned intensive care unit transfers, in-hospital complications, in-hospital mortality, and the rate of 30-day readmission. The *t* test or Mann-Whitney U-test was used to compare means and medians, respectively. The chi-square test was used to compare categorical variables.

Results: Of 3838 patients, about a fifth of ischemic heart disease patients (19.3%) required intensive care unit transfer ($P < 0.001$). Patients admitted through the emergency department were the largest group to require subsequent intensive care unit transfer (65.9% of all cases). The length of stay was significantly shorter in patients admitted to the cardiac care unit, compared with those admitted to other services (3.5 [1.5] days versus 5.8 [5.5] days for patients admitted to other units; $P < 0.001$). Thirty-day readmission rate was significantly lower in ischemic heart disease patients (11.7%) compared with non-ischemic heart disease cases (18.5%) ($P < 0.0001$).

Conclusion: Although patients with ischemic heart disease had a higher risk of being mechanically ventilated or emergently transferred to the intensive care unit, they had lower readmission rates than non-ischemic heart disease patients.

Keywords

Key performance measures, Ischemic heart disease, Outcome, Readmission, Intensive care unit transfer.

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INTRODUCTION

Key performance measures are increasingly being used as tools to evaluate adherence to practice guidelines in daily clinical practice, and they serve as the basis for several quality improvement initiatives^[1]. Key performance indicators (KPIs) are generally designed to address gaps in clinical care, especially where substantial variations in performance exist, and where evidence demonstrates that guideline-recommended therapies improve healthcare outcomes^[2].

In academic centers, clinicians are faced with the primary challenge of finding the appropriate balance between providing quality patient care and encouraging a conducive learning environment for medical students. It is therefore necessary to set standards in clinical settings, in the teaching profession and in medical science so that centers of excellence can be maintained. While these trends require the implementation of a quality management system in academic centers, changes in the healthcare environment, including overutilization of healthcare resources, strategic planning, and management are increasingly becoming important to these centers^[3,4].

Ischemic heart disease (IHD), or coronary artery disease (CAD), is a common cause for hospital admission and mortality worldwide. Recent reports^[5-7] in Saudi Arabia demonstrated a dramatic increase in IHD-related hospital admissions and death. Unfortunately, while quality indicators for the care of patients with IHD have been described in many centers abroad, a paucity of reports describe quality of care among IHD patients in the local region.

This study assesses whether patients with IHD receive comparable care and achieve similar outcomes compared to the rest of patients in the department of medicine of an academic hospital.

MATERIALS AND METHODS

This retrospective study examined the records of all patients admitted to the Internal Medical Services at King Abdulaziz University Hospital—a tertiary community center and the main teaching hospital in Jeddah, Saudi Arabia—from January 2010 through December 2012. All patients with an admitting diagnosis of IHD who were admitted to the medical ward and coronary care unit were identified and enrolled. We excluded all cases with missing or incomplete data. Patients who had elective day care admission, including those admitted for cardiac catheterization, were also excluded from analysis.

The data were collected in three steps. Initially, we identified all admissions to medical services. Next, data were collected, both manually and electronically, from the patients' medical files and from the hospital information system. Then, admissions were categorized according to the admitting diagnosis and patients with diagnoses as acute myocardial infarction, acute coronary syndrome, ischemic heart disease, unstable angina, or subendocardial infarction were identified.

Each case was categorized according to the admitting department (emergency department, intensive care unit (ICU) or elective planned admission through the outpatient department). The time (day vs. night) and month of admission were obtained from the medical records. Similarly, we collected demographic (nationality, gender, and age) and clinical data, including the patients' vital signs and general condition (*e.g.*, mechanically ventilated or bedridden) upon admission. Other variables were also considered, namely the use of insulin infusion during hospitalization, administration of deep venous thrombosis prophylaxis, ICU transfer, length of stay, and development of bed sores. Data on in-hospital mortality and 30-day readmission were documented.

Statistical Analysis

The *t* test or Mann-Whitney U-test was used to compare means and medians, respectively. The chi-square (χ^2) test was used to compare categorical variables. A *p*-value < 0.05 was considered significant. Continuous variables are presented as means \pm Standard Deviation (SD) or median (range), while categorical variables are presented as frequencies and percentages.

Ethical Approval

This study was approved by the Research Ethics Committee at King Abdulaziz University.

RESULTS

Of 3,838 patients admitted to the internal medicine service during the study period, 452 had IHD (11.8% of all admissions). The mean SD age of the IHD cohort was 53.3 (19) years, with females comprising 48.5% of this sample (Table 1). The majority of IHD patients were non-Saudis (63.5%), similar to the proportion of non-Saudis in the non-IHD cohort (64.5%).

Patients were mainly admitted through the emergency department (68.8%) followed by day care services (9.8%) and the outpatient department (21.4%). The cardiology service admitted 20.6% of the IHD cohort. The remaining patients were admitted through different services, including the endocrinology and gastroenterology departments (17.1% and 9.3%, respectively). Diabetes was documented in 194 IHD patients (42.9%), and approximately half of IHD cases ($n = 184$; 43.1%) received venous thromboembolism (VTE) prophylaxis while 38 patients (8%) had long-term oral anticoagulation with warfarin or dabigatran.

About a fifth of IHD patients (19.3%) required ICU transfer as against 7.9% of non-IHD patients ($P < 0.001$). Patients admitted through the emergency department were the largest group to require subsequent ICU transfer (65.9% of all IHD cases). Among IHD patients, ICU transfer was significantly associated with unstable baseline blood pressure at the time of admission ($n = 52$; 59.8%; $P = 0.001$). In all the 87 ICU transfer cases, transfer was associated with tachycardia.

A significantly higher proportion of patients with IHD required mechanical ventilation during their stay in the

TABLE 1.

Comparison of demographic and clinical characteristics between patients with and without ischemic heart disease¹.

Variables	IHD Cohort (n = 452)	Non-IHD Cohort (n = 3386)	P-value
Female	219 (48.5)	1738 (51.3)	.250
Mean age (SD)	53.30 (19.0)	51.2 (19.)	.075
Non-Saudi	287 (63.5)	2183 (64.5)	.680
Bedridden on admission	53 (11.7)	399 (11.8)	.760
Mechanical ventilation required	76 (16.8)	148 (4.4)	< .0001
Unanticipated ICU transfer	87 (19.2)	269 (7.9)	< .001
In-hospital mortality	5 (1.1)	39 (1.2)	.900
30-Day readmission	53 (11.7)*	625 (18.5)	< .0001

Abbreviation: ICU, intensive care unit; IHD, ischemic heart disease; SD, standard deviation.

¹Data are presented as frequency (percent) unless otherwise specified.

* Data were available for 52 out of the 53 readmission episodes.

high observation section of the medical ward (16.8% vs. 4.4% for the non-IHD cohort; $P < 0.0001$). Bedsores were documented in 4.4% of the IHD cohort compared to 6.1% of the non-IHD cohort.

The mean SD length of hospital stay was 5.3 (4.9) days (range, 2-50 days) in IHD patients compared to 6.2 (7.6) days (range, 2-134 days) in non-IHD cases. The length of stay was significantly shorter in IHD patients who were admitted to the cardiac care unit (CCU) compared with those who were admitted to other services (3.5 (1.5) days vs. 5.8 (5.5) days for patients admitted to other units; $P < 0.001$).

In-hospital mortality rate was not different between IHD and non-IHD patients (Table 1). Thirty-day readmission rate was significantly lower in IHD patients (11.7%) compared with non-IHD cases (18.5%) ($P < 0.0001$). Furthermore, 30-day readmission in IHD patients was significantly associated with unstable blood pressure at the time of first admission. Of the 52 readmission episodes, 47 (90.3%; $P = 0.005$) occurred in those who showed unstable blood pressure during their initial admission. Similarly, all 52 reported readmission episodes were associated with baseline tachycardia at the time of admission.

DISCUSSION

Although advances in cardiovascular care have resulted in a substantial decline in mortality and morbidity associated with IHD, there is little evidence that the current best treatments and strategies for these patients are practiced. In order to determine whether patients with IHD at our institution are receiving the same quality of care as other patients admitted to internal medicine, we compared clinical target measures between IHD and non-IHD patients. Unplanned ICU transfer, mechanical ventilation, as well as 30-day readmission and in-hospital mortality rates were selected as performance measures owing to their potential responsiveness to evidence-based care.

Our findings showed that patients with IHD were more likely to be transferred to the ICU or ventilated mechanically than non-IHD patients. While it is difficult

to recognize IHD patients who are at risk for ICU transfer, risk stratification in these patients is essential in order to provide optimal care^[2,8]. We identified that patients with unstable vital signs at the time of admission required ICU transfer. This could serve as an important indicator that such patients who do not meet ICU admission criteria at the time of their presentation would still require close observation in a monitored setting, such as a high observation medical bed or CCU bed, given their high risk for future deterioration that would then require ICU transfer.

Most IHD patients who were subsequently transferred to the ICU of our institution were admitted through the emergency department. Although clinical deterioration may have occurred when the patients were hospitalized on the medical ward, we cannot overlook other contributing factors such as delays in admission to the emergency department or transfer from the emergency department to the medical ward^[9,10], procedural standards and staffing issues^[11], as well as the patient's diagnosis and condition^[12,13]. It is thus important to plan specific interventions that will allow identification of the underlying mechanisms for indirect admissions to the ICU.

The most striking finding is that the mean length of hospital stay was shorter in IHD patients compared to the non-IHD group. Furthermore, IHD patients who were admitted to the CCU had significantly shorter hospital stays than those admitted to other wards. Differences in outcomes of IHD patients, especially in those with non-ST-segment elevation myocardial infarction, have been described following initial admission to specialized cardiac units (cardiac care units or dedicated cardiology wards) compared with non-specialized units, including general medical wards^[14]. As previously reported, admission to cardiac care units is associated with shorter length of hospital stay, improved access of care (higher angiography rates and implementation of secondary prevention prior to discharge) and outcome in patients with IHD^[15].

Interestingly, IHD patients had lower 30-day readmission rates, suggesting a potential success in the initial treatment, and consequently, better quality of care in this

group. However, we believe that because of the stochastic nature of patients' responses to management, readmissions after treatment may sometimes be unavoidable, even after optimal treatment. In addition, the risk of readmission will typically depend on specific patient characteristics, including age, severity of the patient's condition on admission, and presence of comorbidities^[16,17].

This study is limited in focus to only length of stay, ICU transfer, mechanical ventilation, 30-day readmission and in-hospital mortality rates. As a result, other relevant dimensions of patient outcome, such as functional status or quality of life could not be taken into consideration. In addition, several aspects of IHD performance measures—access to early-stage rehabilitation, invasive or non-invasive monitoring, echocardiography, proportion of patients discharged on antiplatelets or lipid lowering agents, and smoking cessation advice, *etc.*^[18] — are not discussed in this report.

CONCLUSIONS

This study is the first to address performance measures in IHD patients at our institution. Our results demonstrate that although patients with IHD had a higher risk of being mechanically ventilated or emergently transferred to the ICU, they had lower readmission rates than non-IHD patients. Whether the selected IHD performance measures discussed in this study can be improved to achieve better outcomes in our patients is debatable. Nevertheless, these can serve as quality indicators to improve the quality of care in patients with IHD in future studies.

Conflict of Interest

The authors have no conflict of interest.

Disclosure

None of the authors received any type of commercial support either in forms of compensation or financial for this study. They have no financial interest in any of the products or devices, or drugs mentioned in this article.

Ethical Approval

Obtained.

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مؤشرات الرعاية الصحية لمرضى نقص التروية القلبية

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المستخلص

مقدمة: تناقش هذه الدراسة مستوى الرعاية الصحية لمرضى نقص التروية القلبية بما في ذلك النتائج المتعلقة بالعلاج والرعاية الطبية، مقارنة ببقية المرضى في قسم الطب في مركزنا الأكاديمي.

الطريقة: أجريت هذه الدراسة بأثر رجعي على جميع المرضى الذين تم قبولهم للعلاج، والتنويم في مستشفى جامعة الملك عبد العزيز خلال الفترة من يناير ٢٠١٠ إلى ديسمبر ٢٠١٢، تضمنت عددا من مؤشرات الأداء المحتملة وتقييمها، بما في ذلك ترددي حالة المريض السريرة والنقل الطارئ لوحدة العناية المركزة (ICU)، ومضاعفات التنويم في المستشفى بما في ذلك حالات الوفاة، ومعدل إعادة الإدخال في المستشفى خلال ٣٠ يوما، وقد تم استخدام اختبارات احصائية مناسبة لمقارنة تلك المتغيرات.

النتائج: من ٣٨٣٨٠ مريضا، نحو خمس مرضى نقص التروية القلبية (١٩,٣%) استدعى نقلهم لوحدة العناية المركزة ($P < ٠,٠٠١$) كما ظهر أن المرضى الذين تم إدخالهم من خلال قسم الطوارئ هم أكثر المرضى الذين استدعى نقلهم لوحدة العناية المركزة في وقت لاحق (٦٥,٩% من جميع حالات نقص التروية) وكانت مدة الإقامة أقصر بكثير لدى مرضى نقص التروية الذين نقلوا الى وحدة العناية المركزة القلبية، مقارنة مع الذين أدخلوا إلى عناية أخرى، وبلغ معدل إعادة التنويم خلال ثلاثين يوما أقل من ذلك بكثير في مرضى نقص التروية مقارنة مع المرضى الآخرين.

الخلاصة: على الرغم من أن المرضى الذين يعانون من نقص التروية القلبية كانوا أكثر حاجة للتنفس الصناعي الميكانيكي أو للنقل الطارئ إلى وحدة العناية المركزة، إلا أن معدلات إعادة إدخالهم إلى المستشفى كانت منخفضة.

كلمات البحث: مؤشرات الأداء، أمراض نقص تروية القلب، إعادة التنويم، تبعيات النقل لوحدة العناية المركزة.