

# Reducing Unnecessary Overuse of Medical Services in King Khalid General Hospital in Hafr Albatin Province: The Effect of Choosing Wisely Campaign 2020

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## Keywords

Choosing Wisely · Overuse of medical services · Creatine kinase-myocardial band · Brain computed tomography · Amoxicillin clavulanic acid · Saudi Arabia

## Abstract

**Introduction:** A Choosing Wisely campaign (CWC) was implemented at King Khalid General Hospital in the Hafr Albatin region of Saudi Arabia to reduce unnecessary overuse of medical services. The aim of this study was to assess the effect of the campaign on reducing three specifically targeted services. **Methods:** The study followed a quasi-experimental pre-post design at the King Khalid General Hospital. The population included all hospital encounters with patients visiting the hospital from October 2019 to January 2020 (pre-intervention phase) and those visiting during February 2020 (postintervention phase). The collected variables included: the number of patient encounters where creatine kinase-myocardial band analyses was performed, the results of creatine kinase-myocardial band analyses performed, the number of patient encounters where brain computed tomography scans was performed, results of the performed brain

computed tomography scans, and the number of patient encounters where amoxicillin clavulanic acid was prescribed. Relative risks were calculated to compare the proportions of the pre- and postintervention periods. **Results:** Our results showed a reduction in the use of three unnecessary services following the implementation of the CWC coupled with improved diagnostic yield. Postintervention, the proportion of patient encounters where creatine kinase-myocardial band analyses were performed declined from 7.1% to 6% (relative risk: 0.84, 95% CI: 0.78–0.91), and the proportion of creatine kinase-myocardial band analyses that yielded a result suggestive of acute myocardial infarction increased from 27.2% to 45.5% (relative risk: 1.6, 95% CI: 1.5–1.8). The proportion of patient encounters where brain computed tomography scans were performed declined from 12.4% to 9.3% (relative risk: 0.75, 95% CI: 0.67–0.83), and the proportion of brain computed tomography scans that yielded abnormal results increased from 22.4% to 37.1% (relative risk: 1.6, 95% CI: 1.4–1.9). The proportion of patient encounters where amoxicillin clavulanic acid was prescribed declined from 79.5% to 54.6% (relative risk: 0.68, 95% CI: 0.67–0.69). **Discussion/Conclusions:** There was a reduction in the use of three unnecessary services following the implementation of CWC coupled with

improved diagnostic yield. Based on these preliminary results, we recommend continuing with the CWC and conducting more robust studies to overcome the limitations of this current study and to assess the long-term effects of the CWC.

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## Introduction

Overuse is classified as one of the healthcare quality problems [1]. Multiple studies suggested that a large proportion of the medical procedures performed for patients were not necessary, and that patients receiving relatively fewer health interventions had better outcomes compared to those receiving more interventions [1, 2]. Moreover, it is estimated that a significant proportion of the global health spending is wasted on these low-value and unnecessary services that are nonbeneficial and may be harmful to the patients [1–3]. Therefore, elimination of unnecessary services is expected to improve quality and reduce costs [2, 3].

In 2012, the American Board of Internal Medicine Foundation developed the Choosing Wisely campaign (CWC) to address the concerns of unnecessary investigations, therapies, and procedures [1–4]. With the ultimate goal of reducing wasteful care [4], CWC intends to assist physicians and patients in choosing evidence-based care that is harm-free, truly necessary, and not duplicative of other investigations, treatments, and procedures already received [2]. CWC endeavors to achieve its goal through changing physician behavior, utilizing the leadership of physicians, and increasing patient/public awareness about low-value health care and its associated risks to patients [1].

Although the campaign was designed as a national campaign in the USA, it has spread to more than 20 countries since its launch [5, 6]. Currently, more than 80 professional societies have developed lists of recommendations that are evidence based and aim to avoid unnecessary “low-value” care [7]. These lists are essential constituents of CWCs in the world [1].

For CWCs to have the required impact, they should target services with high baseline overuse rates, where the reduction of this overuse is anticipated to improve care outcomes. To encourage such change, the interventions of CWCs should be tailored to tackle the main constraints facing both health providers and patients. In addition, clinically meaningful indicators should be used to comprehend the impact of CWC on the targeted outcomes [1].

The success of the CWC is apparent in its global spread, the several initiatives and quality improvement projects, the increase in clinicians’ awareness of the recommendations, and the reduction in service overuse [5, 7]. For example, a study in the USA to assess the effect of CWC on the rate of troponin-only testing to diagnose acute myocardial infarction (AMI) reported that the release of the CWC recommendation was associated with a statistically significant increase in the rate of troponin-only testing [8]. Similarly, a study in Canada concluded that there was a 13.9% reduction in the rate of brain computed tomography (CT) scans for minor head injuries during the initial 3 months, following the implementation of quality improvement initiatives as part of the CWC [9].

### *The CWC in Saudi Arabia*

The CWC in Saudi Arabia was launched by the Ministry of Health in 2018. The vision of the campaign is that healthcare services should be safe, timely, effective, efficient, equitable, patient centered, and provide the appropriate level of services based on scientific knowledge. The mission is to raise physicians’ awareness of overuse, influence their attitudes, and guide clinicians on using resources more efficiently to deliver better care. A National CWC Steering Committee was established to ensure credible and effective leadership support.

One of the sites selected for piloting CWC in Saudi Arabia was King Khalid General Hospital (KKGH) in Hafr Albatin region. This CWC had three recommendations, namely, not to test for creatine kinase-myocardial band (CK-MB) in the diagnosis of AMI; to avoid CT scans of the brain in emergency department patients with a minor head injury who are at low risk based on validated decision rules; not to prescribe antibiotics – namely, amoxicillin clavulanic acid – routinely for acute mild-to-moderate sinusitis unless symptoms last for seven or more days, or symptoms worsen after initial clinical improvement.

For this campaign to be sustained and expanded, it should be first assessed to identify whether it was effective in achieving its targets or not. Thus, the aim of this study was to assess the effect of CWC on reducing unnecessary overuse of medical services in KKGH in Hafr Albatin. Specifically, we assessed the effect of CWC on the prevalence of CK-MB tests in the Medical Emergency Department (MED), the prevalence of performing brain CT scans in the surgical and trauma emergency department (STED), and the prevalence of prescribing amoxicillin clavulanic acid in the MED.

## Materials and Methods

### *Study Setting and Population*

The study followed a quasi-experimental pre-post design at KKGH, a general hospital that has a capacity of 300 beds. The hospital's scope of service includes all surgical and medical specialties except obstetrics and gynecology. In 2019, the total number of patients attending the Emergency Department was 237,673.

The population for both pre- and post-CWC implementation periods included all hospital encounters for patients of all age groups visiting the MED and STED at KKGH from October 2019 to February 2020. The population was divided into two groups for comparison based on the date of implementation of the CWC. The preimplementation group included all encounters from October 2019 to January 2020, and the postimplementation group included all encounters during February 2020. For assessing the prevalence of CK-MB tests and the prevalence of amoxicillin clavulanic acid prescriptions, the preintervention and postintervention study populations were 12,110 and 70,891 encounters of patients attending the MED, respectively. For assessing the prevalence of brain CT scans, the preintervention and postintervention study populations were 13,121 and 3,742 patients attending the STED, respectively.

### *Intervention*

A CWC working group was created in the Hafr Albatin Directorate General of Health Affairs. The National Choosing Wisely Steering Committee held a series of meetings with the Hafr Albatin CWC working group to describe and initiate the campaign. The meetings were attended by the hospital medical director and the six department heads – namely, emergency, radiology, surgery, internal medicine laboratory, and pharmacy departments. The Hafr Albatin CWC working group developed an action plan to initiate and implement the CWC at the KKGH through the following three phases.

#### *Initial Awareness*

In the first phase of the plan, an awareness campaign about CWC was conducted for the hospital staff. Eight department heads, four chairmen, and other hospital staff, including 22 physicians and nursing staff, were briefed about the concept of the campaign and how this would directly affect both the quality of care and the cost to the health care system.

#### *Recommendations Selection*

This was followed by the phase of selecting and finalizing the CWC local list of recommendations. Mindful of the need to secure hospital staff ownership of the CWC, the Hafr Albatin CWC working group invited the targeted hospital departments – namely, emergency, laboratory, pharmacy, and radiology – to develop the CWC recommendations that are applicable to the local setting and that would give the best outcomes. The selection of the recommendations was based on CWC international recommendations. This was backed up by reviewing and analyzing the hospital data to highlight areas of overutilization, specifically noting diagnostic tests, procedures, and therapies having no proven benefit and with possible harm to the patient. The Hafr Albatin CWC working group worked with the targeted departments during this process to refine their selection.

### *Staff and Patient Education*

After selecting the CWC recommendations, the phase of hospital staff education started. Extensive awareness sessions were held with staff of the relevant departments explaining the recommendations and the importance of adherence to them. This was accompanied by availing educational messages about the CWC recommendations through overhead announcements, computer screen savers and hospital screens, emails, roll ups around the hospital, and WhatsApp groups.

This was accompanied by engaging with the patients and the public to promote shared decision-making between the clinicians and patients and to explain its benefits to patient safety. Educational material about the recommendations was developed and distributed to the public, and patients were encouraged to ask their physicians about the need, risks, alternatives, and costs of any tests, treatments, or procedures before ordering them. The staff and patient education phase extended over a 1-month period, starting on the first of January 2019. The adoption of the CWC recommendations was put into practice in January 2020 and was monitored closely by the Hafr Albatin Health Affairs CWC working group and the National CWC Steering Committee.

### *Study Variables and Outcomes*

Data were collected using specifically designed data collection sheets from records of the Emergency Department, Laboratory Department, Radiology Department, and pharmacy by staff members from these departments. The collected variables included the total number of patient encounters at the MED and the STED, the number of patient encounters at the MED where a CK-MB test was performed, the number of patient encounters where the results of CK-MB testing were normal, the number of patient encounters at the STED where brain CT scans were performed, the number of patient encounters where the results of brain CT scans were normal, and the number of patient encounters at the MED where amoxicillin clavulanic acid was prescribed. For all variables, the data were collected for the 4 months preceding the CWC and during the month following the CWC.

To assess the effectiveness of the CWC, the following outcome measures were selected: the proportion of patient encounters in the MED where a CK-MB test was performed, the proportion of CK-MB tests performed with abnormal findings (diagnostic yield), the proportion of patient encounters in the STED where brain CT scan was performed, the proportion of brain CT scans performed with abnormal findings (diagnostic yield), and the proportion of patients encounters in the MED where amoxicillin clavulanic acid was prescribed. The data were fully de-identified.

### *Statistical Analysis*

The grouped data were entered and analyzed using the Microsoft Excel program. The proportions of patient encounters for whom the three targeted services were performed were calculated. The proportions of the performed CK-MB tests and brain CT scans with abnormal findings were also calculated. Relative risks (RR) and 95% confidence intervals (CIs) were calculated to compare the proportions of the pre- and postintervention periods. A *p* value of less than 0.05 was taken to indicate the level of statistical significance.

**Table 1.** Proportion of patients encounters where CK-MB and brain CT were performed and where amoxicillin clavulanic acid was prescribed at KKGH in Hafr Albatin

Phase	Performed/received	Total patients	%	RR (95% CI)	Significance
CK-MB					
Preintervention	5,029	70,891	7.1	0.84 (0.78–0.91)	$p < 0.000$
Postintervention	725	12,110	6.0		
Brain CT					
Preintervention	1,627	13,121	12.4	0.75 (0.67–0.83)	$p < 0.000$
Postintervention	348	3,742	9.3		
URTI amoxicillin clavulanic acid					
Preintervention	56,350	70,891	79.5	0.68 (0.67–0.69)	$p < 0.000$
Postintervention	6,608	12,110	54.6		

**Table 2.** Proportion of patient encounters with abnormal CK-MB and brain CT results at KKGH in Hafr Albatin

	Abnormal results	Total performed	%	RR (95% CI)	Significance
CK-MB					
Preintervention	1,369	5,029	27.2	1.6 (1.5–1.8)	$p < 0.000$
Postintervention	330	725	45.5		
Brain CT					
Preintervention	365	1,627	22.4	1.6 (1.4–1.9)	$p < 0.000$
Postintervention	129	348	37.1		

## Results

Table 1 shows that the proportion of patient encounters in the MED at KKGH where CK-MB tests were performed declined after implementing the CWC. The proportion declined from 7.1% in the 3 months prior to the implementation of the CW scheme to 6% in February 2020, and the difference was statistically significant (RR: 0.84, 95% CI: 0.78–0.91,  $p$  value  $< 0.0001$ ).

Table 1 also shows the proportion of patient encounters in the STED at KKGH where brain CT scans were performed. The proportion declined between the 3 months before the CW scheme in 2019 and the month after the scheme from 12.4% to 9.3%, and the difference was statistically significant (RR: 0.75, 95% CI: 0.67–0.83,  $p$  value  $< 0.0001$ ).

Similarly, Table 1 shows that the proportion of patient encounters in the MED at KKGH where amoxicillin clavulanic acid was prescribed declined between the 3 months before the scheme and the month after the scheme from 79.5% to 54.6%, and the difference was statistically significant (RR: 0.68, 95% CI: 0.67–0.69,  $p$  value  $< 0.0001$ ). Table 2 shows that the proportion of CK-MB tests that

yielded a result suggestive of AMI increased from 27.2% in October to 45.5% in February, and the difference was statistically significant (RR: 1.6, 95% CI: 1.5–1.8,  $p$  value  $< 0.0001$ ).

Table 2 also shows the results for brain CT scans. The proportion of brain CT scans that yielded abnormal results increased from 22.4% in the 3 months prior to the CW scheme to 37.1% in the month after the scheme, and the difference was statistically significant (RR: 1.6, 95% CI: 1.4–1.9,  $p$  value  $< 0.0001$ ).

## Discussion/Conclusion

The aim of this study was to assess the effect of CWC on three services at KKGH, namely, requesting CK-MB tests at the MED, performing brain CT scans at the STED, and prescribing amoxicillin clavulanic acid at the MED. The analysis showed that 1 month after the implementation of CWC, there was a significant reduction in the prevalence of the three targeted services.

Our results showed a reduction in the requests for CK-MB tests in the month following the implementation of

CWC. This practice is in line with guidelines from the American Heart Association and the American College of Cardiology, which state that CK-MB testing is not useful and offers no benefit for the diagnosis of an acute coronary syndrome [8, 10]. The second universal definition of myocardial infarction recommends specific criteria for diagnosis of AMI, in which troponin I or T is the preferred cardiac biomarker and is considered the gold standard biomarker for risk stratification and diagnosis of AMI because of its high sensitivity and specificity for myocardial injury. The use of other markers is no longer recommended [10]. The institutions which have developed interventions to promote troponin-only testing reported substantial cost savings and no negative consequences [8].

Our data showed that there was still residual use of CK-MB tests in KKGH; however, it was not clear if they had been requested to rule out AMI or for the other conditions. This trend was also shown in other countries where a minority of hospitals were found to use a troponin-only strategy despite the recommendations [8, 10]. This might have been justifiable before the development of more sensitive troponin assays when varying combinations of troponin and CK-MB tests had been used to improve early diagnostic sensitivity and reduce the time to rule out AMI. However, contemporary troponin assays have high early diagnostic accuracy, such that the use of other markers adds cost without providing additional diagnostic utility. Therefore, to further reduce the use of CK-MB tests and to sustain the reduction at KKGH, interventions are needed to promote clinician behavior change and to install a strong institutional culture of high-value care [8].

Our data also showed a significant reduction in the use of brain CT scans for patients attending the Emergency and Accidents Department at KKGH. Previous studies showed that over 90% of patients with head injuries did not have a clinically significant traumatic brain injury requiring neurosurgical intervention or admission to the hospital, irrespective of the mechanism of injury. Studies also showed that a third of CT scans used for the evaluation of head injuries were potentially avoidable [9]. Hence, avoiding CT scan use in low-risk minor head injuries based on validated clinical decision rules was identified by the Choosing Wisely initiative and the American College of Emergency Physicians as the top priority for stemming overuse in the ED [11].

Guiding the use of brain CT scans through clinical decision rules has the potential to minimize costs and unnecessary radiation exposure and also to decrease the length of ED stays, thus availing time and resources to

patients more in need for ED care [11, 12]. In our hospital, the reduction in CT use observed during the first month after CWC implementation was modest, especially compared to other studies that achieved a reduction ranging from 13.9% to 5% following the use of decision rules [9, 12]. On the other hand, our results are similar to those of a study conducted in Canada that showed no immediate change in CT use level in the first month after the intervention but showed a steady reduction in the monthly trend for the seven postintervention months [12]. This suggested that there was still an opportunity for further improvement and reliability in applying the decision rules to guide the use of CT scans.

Generally, the effect of using decision rules on reducing CT scan utilization had shown inconsistent results, with some studies showing increased use of CT scans, while others showing decreased CT use after the CWC implementation [9]. This discrepancy in findings may be a result of differences in the studied patients, cultures of medical practice, training of physicians, or study setting variations [12].

In addition, several factors are identified that affect the implementation of decision rules in practice. These include factors related to the physicians and the patients such as knowledge translation around decision rules, physician comfort and personality, fear of litigation and missed diagnoses, and patient expectations and preferences. ED-specific factors that affect the use of CT scans include time and volume pressures, scarcity of information, limited therapeutic options, compensation method, and ease of access to diagnostic imaging [9, 11].

Two interesting observations in our study are that the proportions of CK-MB tests and CT scan results with abnormal findings increased after the implementation of CWC. This was also observed in Canada after the use of decision rules, where the yield of head CTs improved by 2.3% postintervention [12]. This suggests that CWC was not only successful in reducing brain CT scan use but also improved the diagnostic yield of CK-MB tests and CT-identified cases requiring further hospital interventions.

Our study showed a significant reduction in the proportion of encounters at the MED where amoxicillin clavulanic acid was prescribed after the implementation of CWC at KKGH. Antibiotic prescription for uncomplicated acute respiratory infection results in a high cost to the health care system, potential adverse effects for the patients, and contributes to an increase in antibiotic-resistant organisms; hence avoidance of antibiotics in acute respiratory infection is now recognized as an indicator of health services quality [13].

Our study showed a 25% reduction in amoxicillin clavulanic acid prescriptions following CWC. This reduction was more than what was reported from randomized clinical trials testing strategies to reduce antibiotic prescription in the UK. These trials reported a median reduction of 9.7% in the proportion of participants receiving antibiotics [14].

This reduction at our hospital brought the rate of antibiotic prescriptions to a value comparable to the rate of between 50% and 60% reported in the UK in 2015. Still, our proportion is significantly higher when compared with the rate reported from The Netherlands, with approximately 22.5% of patients with RTI receiving antibiotics [13], which necessitates more extensive interventions under the umbrella of CWC. Unnecessary prescription of antibiotics for RTI infections was shown to be driven by many factors, including patient expectations, physician training and specialty, insurance coverage, and direct-to-consumer drug advertising [13]. Targeting these factors by actions such as patient-based interventions, more multifaceted interventions, active clinical education strategies, and training in enhanced communication skills is expected to have a significant effect on antibiotic prescribing [15].

The limitation of our study is that all MED and STED encounters were included in the analyses, the nominators were not restricted to the incidents where CK-MB and brain CT were performed for suspected AMI and head injury cases, respectively, and where amoxicillin clavulanic acid was prescribed for URTI. Similarly, the denominators were not restricted to only suspected AMI, head injury, and URTI cases.

In conclusion, our results showed a reduction in the use of three unnecessary services in KKGH following the implementation of CWC. There was a significant reduction in the use of CK-MB tests and brain CT in MED and STED, respectively, coupled with an improvement in the diagnostic yield of both tests. There was also a significant reduction in the use of amoxicillin clavulanic acid in MED. Based on these preliminary results, we recommend continuing with the implementation of the CWC and conducting more robust studies to overcome the limitations of this current study and assess the long-term effects of the CWC.

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## Statement of Ethics

This study protocol was reviewed and approved by the Institutional Review Board of Hafr Albatin General Directorate of Health Affairs – King Abdulaziz City reg. No. H-05-FT-083, approval number [16]. Informed consent was not required because the study utilized secondary data and did not involve direct contact with the study population.

## Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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We did not receive funding for this study.

## Author Contributions

Aeshah Alsagheir: contributed to the conception and design of the study; interpretation of the data; drafting and revising of the manuscript; approved the version to be published; and agrees to be accountable for all aspects of the work. Muna Hassan Hassanein: contributed to the conception and design of the study; analysis of the data; drafting and revising of the manuscript; approved the version to be published; and agrees to be accountable for all aspects of the work. Abdelkarim Salem Helail and Marawan Arafat: contributed to the conception and design of the study; acquisition of the data; drafting and revising of the manuscript; approved the version to be published; and agrees to be accountable for all aspects of the work.

## Data Availability Statement

The data that support the findings of this study are available on request from Aeshah Alsagheir (the corresponding author).

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