Pilot of Urgent Care Center Evaluation for Acute Coronary Syndrome

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Chest pain is among the most common presenting complaints to the emergency department (ED), estimated to account for 5% to 7% of all visits in the United States.[1] The total annualized cost of these visits represents a substantial financial burden, approaching $7 billion, the largest cumulative cost of any ED diagnosis.[2] However, the benefit and value of routine referral to an ED setting for evaluation of chest pain, along with its associated higher healthcare costs, are unclear. The preponderance of evidence suggests low rates of life-threatening arrhythmia or serious events in most patients being evaluated for chest pain in the ED or during inpatient hospitalization.[3-8] In particular, these data support the practice standards in which patients with chest pain who are at low risk for acute coronary syndrome (ACS) do not require continuous telemetry during evaluation.[9] The logical extension of these data and recommendations further suggests that the infrastructure associated with an acute care facility is not routinely necessary to evaluate patients at low risk for ACS.

The ED at Kaiser Permanente Northwest (KPNW) currently implements a protocol for the rapid evaluation and discharge of low-risk chest pain based on the History, ECG (electrocardiogram), Age, Risk factors, and Troponin (HEART) score.[10,11] Based on positive local and systemwide experience with the HEART score,[12] elements of this ED protocol were adapted to our outpatient setting, starting with our urgent care centers (UCCs). Patients meeting low-risk criteria by HEART score were able to receive complete evaluation in the UCC, and health plan members calling the nurse advice line were explicitly directed to UCCs rather than the ED. Implementation of this protocol was followed by ongoing institutional quality assurance evaluation. Our goals for evaluation of our pilot phase were to measure downstream outcomes and resource utilization and detect adverse events (AEs).

ABSTRACT

OBJECTIVES: Patients with chest pain and concern for potential coronary ischemia are frequently referred to the emergency department (ED), resulting in substantial resource utilization and cost. The objective of this study was to implement a protocol for urgent care center (UCC) evaluation of potential acute coronary syndrome (ACS) and describe its performance.

STUDY DESIGN: This is a descriptive, retrospective review of consecutive cases included in a protocol for UCC evaluation of ACS.

METHODS: Consecutive patient encounters from 4 urgent care facilities of our regional integrated health system were reviewed from a period spanning 4.5 months of the 2017 calendar year. The primary outcome was avoidance of an ED visit within 30 days of the index visit, and the primary safety outcome was serious adverse events (AEs) occurring in the UCC setting.

RESULTS: There were 802 patients evaluated, with a median age of 55 years, and 58% were female. Seventy-three (9.1%) patients were referred to the ED or hospitalized for any reason at the index visit, 10 (1.2%) of whom were ultimately diagnosed with ACS. Within 30 days, 56 (7.7%) of the remaining 729 patients had ED visits or hospitalization for any reason, 2 (0.2%) of whom received a diagnosis of ACS. Overall, 673 (83.9%) patients were managed without any ED visit. No serious AEs were recorded.

CONCLUSIONS: Our initial pilot data demonstrate the feasibility of an outpatient UCC evaluation for ACS without refuting the underlying premise of safety.

METHODS

Study Design

This descriptive study details the results of the pilot phase of our UCC protocol. We conducted a retrospective cohort review of patients captured by our UCC testing protocol during a 4.5-month period

between July 2017 and November 2017. This study was reviewed by the KPNW Institutional Review Board and determined to be exempt from oversight as relating to continuous quality improvement.

Study Setting

Our regional integrated health system has 2 inpatient hospital acute care facilities, 4 urgent care facilities, and approximately 600,000 members. This pilot phase involved implementation of the outpatient protocol at our UCCs. These facilities lack telemetry monitoring and are staffed by primary and urgent care physicians, physician assistants, and nurse practitioners. Each facility is capable of recording and interpreting an ECG, is equipped with a small laboratory, and transfers patients to a higher level of care when deemed medically necessary.

Study Procedures

Patients presenting with symptoms attributable to potential ACS were deemed appropriate for entry into the UCC protocol at one of our urgent care facilities if they met the following criteria: (1) clinically well on subjective assessment, (2) onset of most recent episode of symptoms associated with potential ACS greater than 4 hours prior to presentation, (3) absence of acute ischemia on ECG, and (4) a HEART score prior to obtaining a troponin test result of 3 or lower. Typical patients who would not be considered "clinically well," and thus would be referred immediately to the ED, included those with active chest pain, hypoxia, clinically important arrhythmias, or dyspnea at rest. A pretroponin HEART score was used under the assumption that a patient with a score of 0 for their troponin would then be eligible for discharge directly from the UCC setting. Patients not meeting these criteria were to be referred to the ED.

When it was necessary to perform a troponin test, the UCC staff utilized the local laboratory's iStat device with a cTnI (cardiac troponin I) cartridge (Abbott Diagnostics; Abbott Park, Illinois); this assay is not considered to be highly sensitive. The threshold for a clinically positive result was considered to be greater than or equal to 0.033 ng/mL.

All other contemporaneous testing was ordered at the discretion of the treating provider, as was subsequent referral to the ED.

Selection of Participants

Patients entering this protocol at a UCC in our system were retrospectively identified via electronic health record (EHR) search. All patients for whom a UCC troponin measurement was collected and successfully evaluated were included in our review.

Data Collection and Processing

Information systems analysts provided authors with EHR data based on the defined selection criteria. Authors were provided with medical record numbers of patients, as well as the date and time of any subsequent ED visits. Authors were also provided with cardiology staff interpretations of the ECGs, which were then classified by 1 author (R.P.R.) as "normal," "nonspecific repolarization disturbance," or "significant ST deviation" per HEART score definitions. Aggregate data on the presence of specific comorbid disease were collated from the structured problem list data recorded in the EHR, which was further used to determine HEART score contributions. One author (B.L.E.-B.) performed individual review of all patients with subsequent ED visits in structured format. These subsequent ED presentations were identified either (1) by encounters at 1 of the 2 acute care hospitals in our integrated health system or (2) via the regional Emergency Department Information Exchange (Collective Medical Technologies, Inc; Draper, Utah). Information collated from individual review included ED chief complaint, primary discharge diagnoses, results of troponin testing, and whether the diagnoses constituted ACS.

Outcome Measures

The primary outcome of interest was reduction in ED utilization, measured as any visit to an ED within 30 days of the index visit. These visits were stratified as being within 6 hours of or greater than 6 hours since presentation for the index visit. This dichotomy was created with the intention of capturing transfers directly from the UCC at the index visit in the former, separately from independent presentations in the latter. Secondary outcome measures included cardiac and noncardiac diagnoses assigned at subsequent ED visits or hospitalization. The primary safety outcome of interest was any reported serious event during UCC evaluation of potential ACS. This safety end point was defined as clinical deterioration while present in the UCC, including worsening chest pain symptoms, development of malignant cardiac arrhythmia, receipt of advanced cardiac life support, defibrillation, or death.

RESULTS

During the review period between July 5, 2017, and November 20, 2017, 802 patients were evaluated at a UCC for possible ACS

TAKEAWAY POINTS

Adverse events (AEs) during emergency department (ED) evaluation for rule-out acute coronary syndrome (ACS) are exceedingly rare, suggesting that the assumed necessity of ED resources may be questioned. We designed and implemented a formal protocol based on the HEART (History, ECG [electrocardiogram], Age, Risk factors, and Troponin) score and point-of-care troponin testing for evaluation of potential ACS in our outpatient urgent care center (UCC) settings. In a pilot evaluation of 802 consecutive low-risk patients, 84% avoided any ED evaluation within 30 days and none suffered serious AEs.

‣ Existing evidence suggests that most patients undergoing evaluation for ACS are at low risk for AEs.

‣ Risk stratification and point-of-care biomarker testing is feasible in an outpatient UCC setting.

‣ Most patients reviewed in this cohort safely avoided evaluation in our EDs, representing savings to our healthcare organization and of patients' out-of-pocket costs.

TABLE 1. Risk Factor Prevalence

Risk Factor	Number Flagged	% of Population
Obesity	380	47.38
Smoking	200	24.94
Hypertension	184	22.94
Hypercholesterolemia	104	12.97
Coronary artery disease	89	11.10
Diabetes	86	10.72
Heart failure	41	5.11
Atherosclerosis	2	0.25

and received point-of-care troponin testing. All patients were included in our analysis. The median age of patients tested was 55 years, with an interquartile range of 45 to 66 years. The gender distribution was 58% female. By race, our population was 68% white, 8% Hispanic, 6% black, 5% Pacific Islander, 1% Asian, and 12% multiple races or unknown. Members of the Kaiser Permanente health plan made up 90% of our sample, with 66% commercial insurance purchasers and 24% Medicare product purchasers. The remaining 10% held out-of-network health insurance or were documented as having an unknown insurance status. No Medicaid patients were included in our study population to our knowledge.

The most common comorbidities in our population were obesity, smoking, and hypertension. The distribution of these features in our population is shown in **Table 1**. Most patients had normal or nonspecific ECG findings. Individual HEART scores for each patient could not be calculated retrospectively, specifically due to inability to score the History element. An overview of the

remainder of the elements of HEART score available at presentation are shown in **Table 2**.

Of these 802 patients, 73 (9.1%) were referred to or evaluated in the ED within 6 hours of the index visit. Of these, 24 had positive iStat troponin tests in the UCC and 10 ultimately received a diagnosis of ACS following further evaluation. All cases of ACS were type 1 non–ST-segment elevation myocardial infarction (NSTEMI). Examples of non-ACS causes for elevated troponin included tachycardia-related demand ischemia, congestive heart failure, sepsis, and pulmonary embolism. These subsequent primary diagnoses are included in **Table 3**. The 1 inpatient death in this population resulted from complications following coronary artery bypass grafting (CABG).

Of the remaining 729 patients, 56 (7.6%) were evaluated in the ED within 30 days of a negative UCC evaluation, including assessment for ACS. Two (0.2%) of these patients subsequently had ACS diagnosed. One patient was a 71-year-old male who was evaluated for atypical chest pain and had a negative initial evaluation in the UCC. Thirteen days later, the patient was evaluated for chest pain in the ED, and a quantitative troponin level measured 0.07 ng/mL. He subsequently underwent diagnostic coronary angiography and was referred for CABG. The second patient was a 68-year-old female with chest tightness and body aches who received a negative UCC evaluation and a diagnosis of acute bronchospasm. Two days later, the patient was admitted to the hospital for febrile respiratory illness and contemporaneously found to have a troponin level of 1.83 ng/mL. A nuclear stress test was abnormal, and the patient opted for medical management of presumed ACS. The other primary diagnoses from the subsequent encounters are included in **Table 4**. No deaths occurred from any cause. No safety events were reported or identified on review.

DISCUSSION

We performed a retrospective analysis of a pilot UCC outpatient protocol for the unmonitored evaluation of patients presenting with potential ACS. To our knowledge, this represents the first formal review of such a protocol. Triage protocols for point-of-care or protocolized testing of patients presenting with potential ACS are common as interventions targeting patient throughput, but any unmonitored waiting room time is not by explicit design.[13,14] This unmonitored empiric testing occurs as a pragmatic response to inadequate resource availability. Similar logistics are encountered at our institution, and our novel intervention aims to relieve crowding burdens on our EDs while retaining standards of quality and safety. This also has secondary effects on avoidable resource

TABLE 2. HEART Score Elements

	All Patients n (%)	ED Visit (≤6 hours after UCC visit) n (%)	ED Visit (6 hours–30 days after UCC visit) n (%)
ECG features			
Normal	450 (56.53)	23 (2.89)	22 (2.76)
Nonspecific repolarization disturbance	345 (43.34)	49 (6.16)	34 (4.27)
Significant ST deviation	1 (0.13)	1 (0.13)	0 (0.00)
Age in years			
<45	207 (25.81)	9 (1.12)	14 (1.75)
45-64	371 (46.26)	28 (3.49)	27 (3.37)
≥65	224 (27.93)	36 (4.49)	16 (2.00)
Risk factors			
No known risk factors	215 (26.81)	13 (1.62)	5 (0.62)
1-2 risk factors	293 (36.53)	11 (1.37)	18 (2.24)
≥3 risk factors or history of atherosclerotic disease	294 (36.66)	49 (6.11)	34 (4.24)

ECG indicates electrocardiogram; ED, emergency department; HEART, History, ECG, Age, Risk factors, and Troponin; UCC, urgent care center.

TABLE 3. Non-ACS Primary Diagnoses Following ED Referral at Index Visit (N = 63)

Diagnosis	n
Chest pain	18
Congestive heart failure	5
Dizziness	5
Pulmonary embolism	3
Acute bronchitis	2
Asthma with exacerbation	2
Biliary tract disease	2
COPD	2
Dehydration	2
Migraine headache	2
Pneumonia	2
Sepsis	2
Shortness of breath	2
Supraventricular tachycardia	2
Abdominal pain	1
Acute renal failure	1
Anemia	1
Cough	1
Elevated troponin I	1
Lower back pain	1
Nausea and vomiting	1
Palpitations	1
Pericardial effusion	1
Pleural effusion	1
Syncope	1
Urinary tract infection	1

ACS indicates acute coronary syndrome; COPD, chronic obstructive pulmonary disease; ED, emergency department.

TABLE 4. Non-ACS Primary Diagnoses at Any ED Visit Within 30 Days of Index Visit (N = 54)

Diagnosis	n
Chest pain	15
Biliary tract disease	3
Vertigo	3
General weakness	2
Low back pain	2
Pulmonary embolism	2
Sepsis	2
Urinary tract infection	2
Abdominal pain	1
Acute bronchitis	1
Acute sinusitis	1
Anaphylactic shock	1
Anxiety disorder	1
Atrial flutter	1
Complete heart block	1
Elevated blood pressure	1
Hip pain	1
Hordeolum	1
Hyperglycemia	1
Hyponatremia	1
Influenza	1
Laceration	1
Melena	1
Neck pain	1
Olecranon fracture	1
Other (multiple complaints)	1
Palpitations	1
Paresthesia	1
Pathologic vertebral fracture	1
Spontaneous pneumothorax	1
Stroke	1

ACS indicates acute coronary syndrome; ED, emergency department.

utilization for the health system and of both timeliness and out-of-pocket costs for patients.

No serious events were detected or reported upon review. This is not unexpected, however, considering that the rate of serious events in low-risk patients hospitalized for the evaluation of chest pain has been reported to be as low as 0.18% by Weinstock et al.[8] In their study, of the cases reviewed, none of 7266 patients with normal ECGs and normal vital signs sustained cardiac AEs unless triggered by iatrogenic intervention. This study was not powered or intended to validate the prognostic value of the HEART score, but our observed 1.5% prevalence of ACS within 30 days is similar to that expected for those in a chest pain cohort at low risk for ACS.[15]

In the 10 patients with ACS whose evaluation was initiated at the UCC, all had NSTEMI and underwent early invasive strategies for management. An initial evaluation in UCC introduces delays to definitive diagnosis, including potential harms. No specific harms were identified in our limited cohort.

Continuous quality improvement review for protocol violations was part of this effort, as evaluation of non–low-risk patients increases the likelihood of AEs. For example, if a patient with active chest pain were incorrectly referred to the UCC, this could result in clinically important delays in care if the patient in question were suffering a STEMI. Although this did not occur during our pilot, we did incidentally encounter protocol violations during medical record review, most involving troponin testing in patients with HEART scores greater than 3. These findings inform future individual provider education and quality improvement efforts.

Overall, 673 of 802 (83.9%) patients were successfully managed in the UCC setting with point-of-care troponin testing without ED referral or 30-day recidivism. Prior to implementation of this

protocol, all patients in the UCC who were judged to require evaluation for potential ACS would have been transferred via emergency medical services to the ED for evaluation. No reliable data quantifying the cost reduction of this initiative could be obtained, but it is reasonable to suggest that redirecting even a small portion of our national ED burden to outpatient settings might represent a significant reduction in healthcare expenditures.

Limitations

Our study has many limitations. Although the roll-out of this protocol was closely followed by key administrative leaders, no formal process for submitting safety events or concerns was present. Our integrated health system and EHR typically capture documentation relating to serious events and emergency response to UCCs, but it is still possible that an undocumented safety event was missed. Although 90% of our study population were members of our health plan with reliable 30-day follow-up data, undetected events may have occurred in the remaining 10% whose insurance status was out-of-network or unknown. Given the frequency of expected events overall, the risk of missed adverse outcomes is likely low.

Clinicians had complete individual discretion to include patients in the protocol or to refer them directly to the ED, and this subjectivity at entry introduces a selection bias. HEART score elements abstracted from the medical record may be imprecise due to their dependence on the accuracy of the problem list in structured data. Additional study is necessary to fully quantify a reduction in ED evaluations, as some of the UCC troponin testing may represent "indication creep" resulting from its availability, rather than actual avoided ED referrals. Furthermore, this indication creep may also contribute to the apparent safety profile of this protocol, as the availability of the test may encourage an excess of evaluations in a very low-risk population. Many cases individually reviewed were referred to the ED for further evaluation of other diagnoses, as evidenced by the diversity of final diagnoses in Table 3, suggesting that ACS was not always the most relevant concern. Finally, our results are not generalizable to a setting in which patients with chest pain are not routinely discharged from the ED, as this would likely preclude patients being discharged directly from an UCC setting. Furthermore, it is unclear how these protocols would integrate into a setting in which routine cardiac stress, functional, or anatomic testing occurs in low-risk patients presenting with potential ACS. In our health system, urgent follow-up for stress testing is rare and typically left to the discretion of our primary care providers per routine.

Qualitatively, the implementation of this protocol has been acceptable to clinicians practicing in the UCCs. Initial concerns regarding its roll-out stemmed primarily from concerns regarding lack of monitoring and clinical supervision of patients undergoing evaluation. These were addressed initially with education and subsequently by feedback regarding the ongoing safety monitoring relating to this pilot. Future steps include roll-out to additional primary care locations, along with potentially raising the HEART score threshold for UCC to 5.[12]

CONCLUSIONS

We successfully implemented a pilot protocol for UCC evaluation of ACS. Our early results do not refute the underlying premise of safety. Substantial potential healthcare system cost savings may result from moving the evaluation of patients at low risk for ACS to an outpatient, nonhospital venue. ∎

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