REPORT OF A PILOT STUDY OF CMS

Objectives. We evaluated a telephone-based Care Management System (CMS) designed to streamline the care for 30 pts previously hospitalized with ACS.

Background. Many patients (pts) undergoing emergency room (ER) evaluation for suspected Acute Coronary Artery Syndrome (ACS) could safely be advised to stay at home or visit a same-day clinic instead.

Methods. Patients were provided with 24/7 telephone access to a nurse care manager or program cardiologist who had access to a website containing pts' current medical status. Patients judged by CMS staff as having a moderate risk for ACS were advised to visit a same-day cardiology clinic and those judged as having a low risk were advised to stay home, awaiting a followup telephone contact at 24 hours.

Results. Among the 30 pts enrolled into CMS, 12 initiated at least one telephone contact within 90 days. Of these, 3 had a same-day cardiology clinic visit that revealed no myocardial ischemia and 9 remained at home. At 24 hours, all of these pts remained asymptomatic and none underwent an ER visit or rehospitalization. No deaths or ER visits occurred within 90 days. Based on national data, at least 2 ER visits would have be expected within 3 months, whereas we observed none and did not advise any pt to call 911.

Conclusion. A system incorporating prognostic stratification, 24/7 telephone contact with professional staff and the use of an updated electronic medical record, avoided unnecessary ER visits in pts previously hospitalized with ACS.

Introduction

Substantial advances in treatment for Acute Coronary Syndrome (ACS), including the use of

thrombolysis and percutaneous coronary intervention, have occurred during the past decade (1-

6). Despite increasing public awareness of the benefit of early reperfusion strategies, no

significant reduction in patient decision time, which accounts for most of the pre-hospital delay,

has been achieved during this period (7). Shortening patient decision time could substantially

hasten the delivery of thrombolytic and percutaneous interventional therapies for acute MI and

reduce death and the rate of complications from acute MI, including heart failure and

dysrhythmia (7).

For conditions other than ACS, telephone triage systems implemented by nurses have

reduced the use of ER's and increased the use of urgent care clinics (8). However, triage nurses

almost invariably advise patients reporting cardiovascular symptoms to call 911, which patients

do not perceive as an advantage over calling 911 themselves. Moreover, triage nurses generally

lack access to an **electronic medical record** containing patient data obtained **prior** to the

patient's call and they rarely contact patients **after** the crisis is over. Consequently, an

opportunity to enhance the continuity of care is often lost.

To address these patient-related and system-related issues, we developed a telephone-

based Care Management System (CMS), available 24/7, to streamline care following the onset of

recurrent cardiovascular symptoms. CMS was designed to shorten patient decision time, reduce

ER arrival time, hasten the delivery of definitive hospital care to patients with acute ST-segment

MI and to enhance the continuity of care in the days and weeks following patient-initiated

telephone contacts.

Methods

We selected a sample of 48 non-consecutive patients hospitalized at the Palo Alto Veterans

Affairs Medical Center for treatment of ACS during the period April-September, 2005 for review

of medical records. Eligibility included standard ECG and enzymatic criteria for ST-segment

elevation myocardial infarction (STEMI), or unstable angina/non-ST segment MI (Non-STEMI)

or hospitalization for evaluation of cardiovascular symptoms in patients with previously

documented coronary artery disease. Of these 48 patients, 31 or 65% met eligibility criteria and

were contacted by telephone by study staff. Among these 30 men and one woman, 30 or 95%

(62% overall) agreed to participate and were enrolled in the project. The mean age of these

patients was 72 ± 6 years.

    Study staff mailed printed educational materials to patients describing the background,

rationale and methods for the study. During a telephone-mediated **educational session** with the

patient, the nurse care manager reviewed these materials and responded to patients' questions.

The nurse care manager instructed patients to initiate a **test call** within the week after enrollment.

During the scheduled routine **followup telephone contacts** with patients at 1, 2 and 3 months,

the nurse care manager followed a standard protocol to evaluate patients' symptoms, review their

medications, and review the results of specialized tests, including ECG's recorded since the

previous contact.

    She documented that patients had been prescribed cardioprotective drugs and

nitroglycerine. She instructed patients in how to recognize symptoms of possible heart attack and

stroke that required immediate telephone contact with 911. The time devoted to each patient was

approximately 45 minutes, divided into the 20-30 minute educational session and three telephone

contacts of 5 minutes each initiated by the nurse care manager at 1, 2 and 3 months.

The nurse care manager instructed patients that they could discuss their medications and symptoms with her during clinic hours Monday-Friday 8 AM – 5 PM and with the program cardiologist after hours. After four rings, telephone calls to the **nurse care manager** were automatically forwarded to the program **cardiologist**. Patients were instructed that if they did not receive a response from either the nurse care manager or the cardiologist within 20 minutes, they should call 911.

Decision-making by CMS staff was based on AHA/ACC guidelines for STEMI (9) and non-STEMI/unstable angina (10). Important features of **baseline** risk established upon enrollment included a history of previous MI and the extent of left ventricular dysfunction and/or myocardial ischemia during hospitalization (11). Important features of the **interval history** since the patient's last contact with CMS staff included: 1. Frequency and severity of chest pain and other cardiovascular **symptoms** and changes in the pattern and dosage of anti-ischemic **medications**. 2. Frequency of **unscheduled medical contacts** prompted by new or worsening cardiovascular symptoms, including ER visits and hospitalizations. Patients who telephoned the nurse care manager or cardiologist and were judged to be at **moderate risk** for ACS based on current symptoms and other information obtained prior to the telephone contact were advised to attend a **same-day cardiology clinic**. Patients judged to be at **low risk** were advised to remain at home, awaiting **telephone follow-up contact** 24 hours later, unless a change in symptoms prompted an earlier contact with the nurse care manager or 911. All patients initiating telephone contact with CMS received a followup telephone contact 24 hours later to assure that their clinical status was stable and to respond to patients' questions about any follow-up tests that were ordered or any new prescriptions that were written.

Three strategies designed to reduce the time from onset of symptoms to ER arrival **(ER delay time)** were incorporated into CMS: 1) A telephone practice contact (simulation) initiated by the patient in the two weeks after enrollment enhanced patients' efficacy to initiate telephone contact in the event of an experienced need. 2) Patients were trained to recognize symptoms requiring action and instructed in how to use the 24/7-telephone system to respond to these symptoms. 3) Patients established a personal relationship with the same nurse care manager responsible for responding to any subsequent patient-initiated telephone contacts

Three features designed to reduce the **frequency of ER visits** were incorporated into CMS: 1) **Guidance and instruction** provided by nurse care managers at baseline and in follow-up increased not only patients' recognition of cardiovascular symptoms, but whether these symptoms required telephone contact with the nurse care manager. 2) Periodic nurse-initiated **follow-up telephone contacts** permitted the dosage of anti-ischemic medications to be optimized and angina to be attenuated. 3) Provision of a same-day cardiology clinic visit represented a convenient alternative to an ER visit for patients judged to be at moderate risk for ACS.

Follow-up telephone contact with the patient initiated by CMS staff 24 hours after an ER visit or hospitalization not only helped to assure that patients' medical status remained stable, but it also permitted CMS staff to respond to patients' and families' questions or concerns about any follow-up **tests** scheduled or any new **prescriptions** written in the ER.

We created a web-based **database application** containing socio-demographic, medical history and cardiovascular data, including test results, obtained at baseline, during nurse-initiated followup telephone contacts or during patient-initiated telephone contacts with CMS staff. The CMS staff had 24/7 access to these data via the internet using a TREO-650 Smart Phone.

Results

During a 3-month period, 12 of the 30 patients (40%) initiated at least one telephone contact with CMS, all during clinic hours (Table 1). Only 2 of the 22 patient-initiated telephone contacts were made after-hours to the program cardiologist: one was made to request a prescription refill and one was to request a clinic visit (Table 2). The remaining 20 patient-initiated telephone contacts were made to the nurse care manager.

Reasons for patient-initiated contacts were to report **symptoms** in 14 cases (65%) or to request a **clinic visit** or a **prescription** in 8 cases (35%). Four patients reported atypical chest pain, two reported exertional angina, four reported dizziness or fatigue, two reported gastrointestinal symptoms, one reported eye pain and one reported arm pain. The advice provided by CMS to the 12 patients initiating telephone contact was to **stay at home** in 9 cases and to visit a **same-day cardiology clinic** in 3 cases. No patient was advised by CMS staff to call 911. Among the 3 patients who made a same-day clinic visit in response to the advice provided by CMS, 2 were classified at baseline as moderate-risk and one was classified as high-risk. One patient attending the same day clinic exhibited exacerbation of chronic obstructive pulmonary disease and was hospitalized. One patient who had a pacemaker pocket infection and one patient who had acute bronchitis were discharged home. Among the 9 patients advised by CMS staff to stay at home in response to a patient-initiated telephone contact, 4 were classified at baseline as low risk, 4 were classified as moderate risk and one was classified as high risk.

A 13th patient, a woman who experienced severe, progressive chest pain accompanied by dyspnea and nausea, called 911 directly, as she had been advised to do during her baseline telephone educational session. She was transported directly to a hospital, where she underwent emergency coronary angiography and was found to be surgically inoperable She had been

classified as high risk on enrollment based on a history of previous MI, angioplasty and CABG

surgery and a pattern of frequent ER visits.

A CMS staff member unassociated with delivery of the intervention telephoned patients

at 3 months to record their followup status. None of the 30 patients reported an additional ER

visit or rehospitalization and none died.

Discussion

Not all of the 5 million Americans seeking ER care for acute chest pain annually, including the

40% with established coronary artery disease, have a high risk for ACS: many have non-

ischemic cardic or non-cardiac symptoms (12). Indeed, most patients undergoing ER evaluation

for suspected ACS are found to have a non-cardiac basis for their symptoms (13) and fewer than

20% of those who are subsequently hospitalized from the ER demonstrate evidence of acute

myocardial necrosis (14). Accordingly, the current policy of referring every patient with a

suspected acute coronary artery syndrome (ACS) to the Emergency Room (ER), irrespective of

his or her risk for acute myocardial infarction (MI) or death, results in the referral of many low

and moderate risk patients (15) whose care could potentially be more efficiently managed by

other means, including an Urgent Care or same-day clinic visit. To our knowledge, CMS is one

of the few operational telephone triage systems that advise patients reporting cardiovascular

symptoms to remain at home or to attend a same-day cardiology clinic in lieu of an automatic

call to 911.

Patients with possible ACS are presently offered only two acute **treatment alternatives**:

call 911 for transportation to the ER or drive to the ER. However, in recent years, ER closures

and reductions in ER staff have resulted in increasingly long waits for care within the remaining

ER facilities (16). Urgent care provided in an outpatient setting such as a same-day cardiology

clinic could meet the needs of many patients with suspected ACS, especially those with

established coronary artery disease, but this option is not generally available.

Our policy of advising patients judged to be at low risk for ACS to remain at home,

awaiting a followup telephone contact, is consistent with that of policies used by most ER's to

discharge the nearly half of patients presenting with cardiovascular symptoms who are found to

be at low risk for ACS. Present ER discharge policies are based on the presumption that patients

presenting with chest pain who are at low risk for ACS can be reliably identified on the basis of a

review of the history and the results of laboratory testing (12). At issue are the relative cost,

convenience and safety of stratifying risk low-risk in the ER, as in standard care, or by

telephone, as in CMS. The process of risk stratification is identical, irrespective of the venue in

which the patient presents.

Patients who can be reliably risk stratified by telephone contact or by visiting a same-day

clinic have little need to visit an ER at all, especially if they are also provided with 24/7

telephone access to CMS staff and are followed up by CMS staff at 24 hours, as in the present

study. We also had an important advantage not generally available to ER physicians: immediate

access to an electronic database containing updated historical features and test results that

determine the risk of ACS.

The lack of immediate access to prognostically important data during ER visits presently

accounts for much of the cost and inconvenience associated with stratifying risk in the ER. In

contrast, the data available in the CMS database that were obtained from medical records during

the index hospitalization and by post-hospital telephone contact with patients during the

enrollment process were immediately available to CMS staff responding to patient-initiated

telephone contacts. This permitted CMS staff to provide patients with two convenient

alternatives to calling 911: patients judged to be at low risk were advised to stay at home, awaiting a telephone followup contact 24 hours later and patients judged to be at moderate risk were advised to visit a same-day cardiology clinic.

In contrast to most published studies of suspected ACS, (17) all of our patients had been previously diagnosed as having coronary artery disease. The pattern of risk for subsequent ACS established at baseline in the present study was comparable to that of other studies of patients hospitalized for the treatment of suspected ACS (18). In our study, 67% of patients were low risk, 27% were moderate risk and 6% were high risk for subsequent ACS. It is notable that 18 of the 22 telephone contacts (82%) initiated by patients were in those classified as moderate or high risk, although such patients composed only one-third of the patient population. Moreover, only one low-risk patient initiated a telephone contact to report symptoms.

It is uncertain how many of the 9 patients advised by CMS staff to stay at home, awaiting a followup telephone contact, would otherwise have visited an ER. Approximately 20% of patients hospitalized for treatment of suspected ACS undergo ER evaluation for recurrent symptoms during the following 12 months (19) and the rate of rehospitalizations in the year after ACS is approximately 10% (20). Since the rate of rehospitalization is higher in the first three months than in any subsequent quarter of the year following ACS, we would have expected as many as 3 of our patients to have undergone an ER visit during a 3-month followup. However, we did not advise any of our patients to have an ER visit and none did. The only patient with a clear-cut ACS was hospitalized directly after calling 911.

The same-day cardiology clinic visit incorporated into CMS was similar to the specialized outpatient **chest pain unit** (CPU) developed by Farkouh et al. at the Mayo Clinic (21) to identify **moderate-risk** patients with unstable angina not requiring hospital admission,

who composed nearly half of those admitted to the CPU for observation. Expanding on this approach, we used a stepwise risk stratification process to identify and refer patients classified as having a **moderate risk** of ACS or a non-cardiac problem that could not be managed by telephone. The fact that none of the three patients who visited our same-day cardiology clinic demonstrated clinical evidence of ACS reflects the clinical fact that patients with established coronary artery disease often have co-morbid conditions and non-ischemic cardiac abnormalities. Our use of a same-day clinic is also consistent with clinicians' common practice of fitting patients needing immediate attention into their daily clinic schedules. Thus, we have adapted practices and standards that are currently used in ER settings to triage moderate risk patients to the CPU and high risk patients to the hospital, but we have done so in the outpatient arena, in lieu of an ER visit. Indeed, the same diagnostic ECG and point-of-service enzyme tests for cardiac necrosis presently available in ER's are generally available in the same-day cardiology clinic. This arrangement eclipses many of the distinctions that presently distinguish ER care from urgent care or same-day care.

The present observational study, conducted non-randomly on a relatively small patient sample in a single medical institution, shows promise for coordinating the care of patients with established coronary artery disease who experience recurrent symptoms. The results appear to justify the future application of systematic approaches to larger numbers of patients with documented coronary artery disease who are treated in a variety of medical institutions. Although participants in the present study were identified soon after hospitalization, most of the 13.5 million Americans with established coronary artery disease (22), including those not previously hospitalized, could benefit from a system like CMS that coordinates care over the long-term.

Conclusions

We used standard medical practices and standards to coordinate the care of patients who initiated

telephone contact with CMS. We provided a same-day cardiology clinic visit or simple

reassurance in lieu of an ER visit for patients judged to be at moderate or low risk for ACS.

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Table 1: Summary of Patient-initiated Telephone Contacts with CMS

| Baseline Risk | | Pts Initiating | Advice Provided by CMS Staff | | |
Status (n)		Phone Contact	Stay Home	Visit Clinic	Call 911
Low	20	4	4	0	0
Moderate	8	7	5	2	0
High	2	1	0	1	0
	30	12	9	3	0

Table 2: Reasons for Patient-initiated Telephone Contacts

| Baseline Risk | | Report | Administrative | Total Phone |
Status (n)		Symptoms	Reasons	Contacts
Low	20	1	3	4
Moderate	8	8	2	10
High	2	5	3	8
	30	14	8	22