Acute Care for Elders (ACE) Tracker and e-Geriatrician Telemedicine Programs

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Introduction to ACE

The Acute Care for Elders (ACE) Program was developed, implemented, and results published by Dr. Seth Landefeld, Dr. Robert Palmer, and colleagues [1] 20 years ago. The basic elements of ACE focus on preventing functional decline, medical care review with a geriatrician, early discharge planning, interdisciplinary team rounds, and patient-centered plan of care. The ACE model of care is designed to standardize and improve the care for hospitalized seniors age 65 and older. Multiple comorbidities and complex medical needs are common among this population. The ACE Program serves seniors at risk for developing geriatric syndromes and functional decline. This model of care has been described more fully in this book by other authors.

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ACE at Aurora Health Care

Aurora Health Care in Wisconsin is a large, not-for-profit health system that has widely disseminated the ACE model of care through multiple strategies. Aurora provides hospital care to approximately 30,000 seniors per year within their 14 hospitals in Eastern Wisconsin. Due to this large senior population and the unique vulnerabilities of older individuals during their acute illness, Aurora adopted the ACE model of care. The first ACE unit in Wisconsin was started in 2001 at Aurora Sinai Medical Center, led by Dr. Ellen Danto-Nocton and Dr. Michael Malone. This first ACE unit demonstrated improved patient quality, interdisciplinary collaboration, and improved processes of care. Continuous improvement led to enhancement to the Aurora's ACE model. ACE Tracker was developed in response to our goal of measuring outcomes and processes of care on a real-time basis. The e-Geriatrician service was implemented as a strategy to spread the limited resource of geriatricians. The addition of the ACE Tracker tool and the e-Geriatrician service differentiate the ACE model of care at AHC. The implementation of these elements facilitated wide dissemination of ACE within a large health system.

Geriatricians are the foundation of ACE at Aurora Health Care. Geriatricians attend daily team rounds at the large urban area hospitals where they are typically based. Aurora employs about ten geriatricians, all within the metropolitan Milwaukee area. To accommodate the needs of the smaller, non-urban and rural sites where there are no geriatricians on staff, the e-Geriatrician service was developed. This model requires the geriatricians to join rounds remotely twice per week through teleconferencing technology described below. Currently at Aurora Health Care there are more than 40 inpatient units that implement the ACE principles of care through use of evidence-based practices, electronic health record content and functionality, and the use of multiple quality improvement strategies [2].

The Structure of Aurora Health Care's Senior Service Line

Aurora Health Care leaders chose a matrix organizational structure for their senior service line (SSL) to serve the entire system. The service line leaders work at the health system level, reporting to Chief Medical and Nursing Officers. The service line leaders also work with each hospital site leaders and staff. This matrix structure allows authority, accountability, and resource control for the program to be balanced between system level leaders and local facility managers [3]. The SSL is comprised of an interdisciplinary team to address the complex and diverse needs of the senior population. This SSL leadership team is comprised of a geriatrician, a geriatric social worker with administrative credentials, and an advanced practice nurse with gerontological board certification. These SSL leaders are charged with improving care for seniors throughout the Aurora system by developing, disseminating, and sustaining geriatric models of care. The SSL has a department budget, which supports the dissemination of geriatric models and geriatric professional education throughout the system.

The SSL is responsible for achieving optimal geriatric program outcomes by working with clinicians and site level leaders. The SSL leaders work with each site to: (1) teach the principles of ACE care, (2) increase the number of clinicians utilizing ACE principles, (3) support ACE interdisciplinary team members, and (4) measure quality outcomes and processes of care. The SSL leaders also assist in developing and guiding site-based ACE advisory teams, described below.

Leadership Support for Acute Care for Elders

The SSL leaders at Aurora Health Care started by building a business case for the ACE based on needs and return on investment assessment. They established direct linkages to system and site-based leaders who work to ensure that ACE is aligned with the organization's strategic plan and goals. The plan defined the required resources, identified a budget, leadership responsibilities, outcome measures, and a timeline. Small pilot projects were used to facilitate the identification and refinement of key metrics and test processes. Outcome data demonstrated the success and value of the program. Leaders planned early for program dissemination by inviting future unit/site representatives to serve on the planning/advisory team. This facilitated a more rapid implementation to those additional units and created frontline staff buy-in.

Education, Direction, and Communication

The SSL leaders work with the site leaders to identify opportunities to improve care for seniors by implementing the ACE model of care. The decision is typically based on the volume of seniors served on the unit, staff maturity and experience level, culture of the unit, and quality measures. Unit implementation starts by identifying a site leader who provides guidance to the team for model implementation, barrier identification and mitigation, and tracking outcome data. The site leader then identifies members for their site-based team that includes frontline staff representing all the disciplines, nursing leaders, and physician champions. The SSL and site-based leader provide educational sessions for the interdisciplinary staff team members on key topics including the ACE Program, ACE concepts, and geriatric syndromes. The team learns about using the assessment tools and interventions and how and when to use them. Education alone is not enough to change practice. The geriatrician leader who works with the interdisciplinary team can help guide the clinician practice through feedback and recommendations at the daily interdisciplinary team rounds. This "just in time" teaching method applies feedback to clinicians when the impact is most poignant.

The site-based ACE advisory teams meet monthly when the program is new to provide additional education and support. As teams mature, the meetings may be scheduled less frequently. Some of the ACE advisory teams include a patient representative, and representatives from local long-term care facilities. This facilitates a community approach to the ACE Program. The SSL leaders share outcomes from the local hospital and from other Aurora Health Care hospitals. This allows the team to develop quality improvement plans and to celebrate successes. It also demonstrates value of ACE to hospital leaders. Multilevel communication needs to occur on a regular basis in order to keep the momentum going and sustain the program. Further, we have found value in sharing patient stories which describe the care provided to older persons by the team. This brings the ACE concept into real practice.

A Description of ACE Tracker

Acute Care for the Elderly (ACE) Tracker (Fig. 4.1) is an innovative near-real-time electronic clinical decision-support tool that extracts key demographic, assessment, and care parameters documented in the EHR and displays the information for all hospitalized patients who are 65 years and older at each facility, on a daily report used by interdisciplinary team members to facilitate care [2]. ACE Tracker was developed at AHC by a team of software programmers, geriatricians, nurses, a social worker, and pharmacists in 2003. Geriatricians identified the need to efficiently review an entire unit's senior population during daily interdisciplinary rounds. The original ACE Tracker utilized query tools available in a platform provided by the Cerner Corporation.

Fig. 4.1 ACE Tracker printout

Table 4.1 Daily ACE Tracker patient variables

		Blood urea
Room/Bed	History of falls	Nitrogen/Creatinine ratio
Patient age	Bed rest order	Body mass index
Length of stay	Therapy orders	Goals of care discussion trigger
Cognitive impairment	Restraints	Social work/Case manager consult
Elder Life Program Trigger (sensory impairment)	Activity of Daily Living Score	Advance directives (in place)
Delirium symptoms	Central venous catheter (in place)	Numeric Pain Score
Antipsychotic drugs (ordered or administrated)	Urethral catheter (in place)	30-Day Readmission
Number of scheduled medications	Pressure ulcer stage	Beers Criteria Drugs (ordered or administrated)
Morse Fall Scale Score	Wound Consult	Braden Pressure Ulcer
		Risk score

The tool was refined in Cerner over the course of 8 years. When the organization transitioned to an Epic-based EHR platform in 2011, the ACE Tracker report layout and parameters were maintained with the inclusion of additional parameters.

The current ACE Tracker utilized by Aurora Health Care is formatted with SAP Business Objects (BO) Crystal Reports using Structured Query Language (SQL) to communicate to the Epic Clarity 2010 relational database. The report is set to refresh daily against a copy of the production environment that occurs at midnight with data entered into the EHR from multiple sources over the previous 24–48 h depending on the parameter. The tool provides a unit-based patient list of every hospitalized older adult who is currently admitted to each facility as an inpatient or observation case. The data for 30 parameters (Table 4.1) are displayed using abbreviations with a legend provided at the bottom of each page that contains details about the source for each parameter to aid in interpreting and troubleshooting the report as needed. A clinical "red flag" signified by an asterisk (*) is used to depict findings that indicate when the patient status appears to be changing in an undesirable direction. Clinicians use the report tool to monitor patient progress and consider adding supportive care interventions during the stay and post-discharge.

ACE Tracker Validation

The caregivers who use the tool must understand what each of the clinical decision support parameters mean and develop confidence that the data reported on the tool are accurate. Inaccurate or misleading results can occur for several reasons—including inaccurate or late data entry or incorrect programming. It could also mean that the results are accurate and that the data appear the way it does because of the known limitations in the functionality (e.g., data will be missing if entered after the established cut off time for the report). Clinicians are encouraged to monitor the accuracy of the report and to contact the ACE Tracker team if discrepancies are identified.

The accuracy of the ACE Tracker report was clinically evaluated for accuracy by an interdisciplinary team using a convenience sample of patients receiving care on eight medical/surgical inpatient care units in one urban tertiary medical center. The validation was carried out with a sample ($n = 94$) of older adults (mean age = 78 years; SD = 8; range = 65–95) with more than half (55 %) male. Most patients were evaluated several days into their hospital stay (average day of stay was 7.6 days; range 1–53). Many older adults were at risk for falls (59 % had a Morse Fall Scale of ≥ 45) and pressure ulcers (46 % had a Braden Score of <18). Three-fourths of the patients had an order for therapy. The average patient was on 12.5 scheduled medications (SD = 13.8; range 0–25). Many (54 %) had orders for drugs that are on the Beers list of potentially inappropriate medications for older adults. Most Beers list drug orders originated from the standard "as needed" (PRN) medication computerized physician order set. Only 28 % of patients actually received medications on the Beers list. The Beers list drugs that were used included lorazepam and zolpidem for sleep. No patient required the use of restraints during the clinical evaluation.

The ACE Tracker values matched the clinical values for all parameters except restraints and urethral catheters. The ACE Tracker identified six patients with restraint documentation that was not appropriately discontinued in the EHR at the time when the patients were receiving care in an intensive care unit. The clinical reviewers identified two patients with urinary collection bags that were later found to be associated with condom (not indwelling) catheters, indicating a documentation error, rather than a problem with the ACE Tracker functionality. This validation study demonstrated that the ACE Tracker provided a unit- and patient-level summary of accurate and reliable data from EHR for review by the interdisciplinary team during rounds. The tool also provides unit leaders with an opportunity to view correct documentation, before it becomes a permanent part of the patient record. Just as one would standardize a new instrument (e.g., a blood pressure cuff or a glucometer) in a clinical setting, the authors of ACE Tracker require validation of the tool, prior to the implementation of this report in clinical sites beyond Aurora Health Care.

How the ACE Tracker Is Used

Daily interdisciplinary rounds are held in every nursing unit in Aurora Health Care to discuss and plan each patient's care. The rounds are the primary locus of developing and implementing the patient's plan of care from admission to discharge. The rounds are attended by the staff RN, unit RN manager, unit clinical nurse specialist (CNS), social worker, case manager (CM), therapy representative, pharmacist, and the scheduled e-Geriatrician. The staff nurse presents each patient per a standardized list of topics and then each discipline will contribute to the overall discussion and develop a plan for discharge. Each patient's discussion is limited to 2–3 min to efficiently review all patients on the unit.

The ACE Tracker was originally envisioned as tool for the geriatrician to efficiently assess an entire unit's census during their attendance at the daily unit level interdisciplinary rounds. Being efficient was necessary because the interdisciplinary team has 2–3 min to discuss each patient. Previously, the geriatrician would review the patient chart, record relevant details, and develop questions prior to the daily interdisciplinary rounds. This behavior was inefficient and did not require the expertise of a geriatrician. The development of the ACE Tracker provides a checklist of patient's key risk indicators. This report allows the geriatrician to provide recommendations to the assembled interdisciplinary team.

Although the ACE Tracker was originally developed as a tool for geriatricians, it also facilitates the non-geriatrician by providing a broad overview of geriatric risk factors and nursing practice indicators. The ACE Tracker is easily downloaded from within the EHR. The unit nursing leaders can access the ACE Tracker as a daily tool to assess nursing practice on a unit, provide a "geriatric" perspective and "just-in-time" teaching to staff when the e-Geriatrician is not at daily rounds. The power of the tool stems from the fact that the clinical staff can efficiently assess an entire unit's census from the tool, as well as risk factors for each senior. For example, the CNS can quickly see that a 91-year-old patient with a body mass index (BMI) of 17 and Braden score of 10 is at high risk for skin breakdown. The CNS can then verbally follow up with the nurse during daily rounds to employ proper interventions. Additionally, the CNS can assess if skin precautions are employed in the patient room and that proper documentation in the nursing teaching record and the interdisciplinary care plan are present. In short, the ACE Tracker provides a real-time checklist which can increase the number of health care professionals who use geriatric principles as they care for older patients.

Additionally, the power of the ACE Tracker as a tool for practice improvement can be illustrated by its use at differing levels within the organization. The patient level information is used on a daily basis during interdisciplinary rounds. Data from the ACE Tracker are also aggregated by unit and month, and then reported to each hospital in the system to provide a broader overview of practice. Outcomes from these reports are monitored by ACE advisory teams and compared with other system hospitals. The following outcomes are commonly monitored at all Aurora Health Care hospitals: indwelling urinary catheter use, rate of early therapy assessment, and rate of documentation of patients' advance directives. These variables illustrate longitudinal site level analysis of care reports, which provides feedback directly to the frontline clinical staff. Furthermore, these reports are also shared with site and system leaders to demonstrate the value of this model of care.

Role of the "e-Geriatrician"

An integral component of the Aurora Health Care ACE model is the "e-Geriatrician." Geriatricians who live and work in Milwaukee are assigned to a hospital at a non-urban, remote site. To access patient information, the e-Geriatrician is provided basic privileges at these distant hospitals. Daily interdisciplinary team rounds are held on each hospital unit and the e-Geriatrician participate twice per week. At the appointed time for the interdisciplinary team meeting, the e-Geriatrician simply calls to the remote team meeting. The e-Geriatrician does not bill for services, as they are consulting with the team, and not providing direct patient care. Each hospital pays for the e-Geriatrician's time through their budgets. The e-Geriatrician has access to the EHR and to ACE Tracker. The role of the e-Geriatrician at rounds is to provide academic detailing and practice recommendations in an educational environment. Using the patient variables on ACE Tracker, the e-Geriatrician is able to speak to the needs of vulnerable older patients.

To have an optimal experience the team follows basic rules of communication. The team clearly reports the name and room number of the patient. The phone is placed close to the person who is talking. The e-Geriatrician picks a quiet area to minimize background noise, while the team discusses each patient. The e-Geriatrician is given adequate time to give input that helps guide the development of the plan of care.

Although the e-Geriatrician is joining the team remotely, via teleconferencing technology, it is also important to develop a relationship with the team in person. If the e-Geriatrician is simply a "voice on the phone," recommendations are not likely to be implemented and the program will not be sustainable. As the program is being established the e-Geriatrician needs to be with the team in person to build relationships and credibility. When the program is up and running, the geriatrician needs to visit the team periodically to maintain the relationship by participating in rounds, attending ACE advisory team meetings, providing educational sessions and meeting with leaders and/or hospitalists. Due to the challenges of on-going staff turnover, and competing priorities, it is important to maintain a good working relationship. Without an on-going relationship, the e-Geriatrician may be reduced to a voice on the phone, and may be dismissed by the team and site leaders.

Measuring Outcomes

The Acute Care for Elders model has been shown to improve quality of care for older hospitalized patients. When implemented in varying degrees, ACE significantly impacts patient and system-level outcomes [4]. A systematic review and meta-analysis has demonstrated the following outcomes associated with one or more components of the ACE model: less falls, a lower rate of delirium, less functional decline, shorter length of stay, fewer discharges to the nursing home, more discharges to home, and lower costs. In addition, Flood [5] reported a reduction in cost and 30-day readmissions for patients receiving care on units with the ACE model in place.

The ACE Tracker [2] can be used as a near real-time outcomes information report. Traditionally, data collection specific to outcomes of interest require targeted collection efforts. The ACE Tracker reporting approach moves beyond collecting data on key indicators and reporting them at a later date, but rather extracts data from the electronic health record in near real-time. The tracking of key geriatric inpatient care indicators provides pertinent information for gauging how well the ACE model is being implemented on any given unit. These data measure processes of care and provide a basis for where to intervene—at the individual patient and/or unit level. In addition to the daily review of individual patient data at the unit level, the ACE Tracker development team has created a mechanism to summarize key outcome indicators reported on the ACE Tracker on a monthly basis. These Monthly Production Reports are intended to provide objective data and identification of variation of care performance over time at each hospital.

The top five most common complications experienced by hospitalized older adults include delirium, serious adverse drug events, functional decline, urinary dysfunction, and falls with possible fracture [6]. Consistent with the ACE model and the known complications experienced by older adults in the acute care setting, the individual patient data elements (reported per unit) displayed on the ACE Tracker report include: patients' age, length of stay, history of cognitive impairment, HELP (vision or hearing risk factors; see

Chap. 2), delirium symptom assessment result, total number of medications, ordered or administered beers medications, Morse fall score, history of falls, presence of bed rest order, therapy involvement (physical, occupational, speech), use of restraints, presence of sitter, activities of daily living score, use of central venous catheter, use of urinary catheter, presence of pressure ulcer and stage, wound care orders, Braden score, serum albumin level, BUN and creatinine, presence of goals of care, pain score, and readmission within last 30 days (Table 4.1).

Findings from a quality improvement project completed in 2010 [7] provide support for the use of the ACE Tracker for improvement of geriatric inpatient outcomes. Between October 2007 and September 2008, 28.0 % of hospitalized older adults who received inpatient care throughout Aurora Health Care had an indwelling urinary catheter in place as of Day 2 of hospitalization. Over a comparison time period of January through December of 2010 (when ACE Tracker was fully implemented), 22.1 % had a catheter in place as of Day 2 of their hospital stay. Thus, the use of indwelling urinary catheters among older adults in Aurora Health Care hospitals decreased after full implementation of ACE Tracker. This analysis demonstrates that the use of the near-real-time ACE Tracker, when used during in interdisciplinary rounds and daily evaluation of vulnerable hospitalized seniors, may improve care for this patient population. Future efforts are needed to examine the impact of interdisciplinary use of the ACE Tracker on health outcomes.

Lessons Learned and Future Implications

Aurora Health Care has had over a decade of experience with the ACE model. Clinicians at Aurora have enhanced ACE with ACE Tracker and the e-Geriatrician service. This experience provides lessons learned and highlights future implications. The e-Geriatrician is not able to bill for the services under the current Medicare fee for service program. The service is sustained by providing time and salary support by the hospital administration. This model may be a good fit under the Affordable Care Act with its focus on value-based purchasing and accountable care organization reimbursement. Identifying vulnerable patients within a population allows clinicians to target care plans to those who are in greatest need. The ACE Tracker and e-Geriatrician may be early steps in managing patients toward improved outcomes and reduced costs.

The variables noted on the ACE Tracker are populated by the clinical staff documentation of patient care. The accuracy of the variables is dependent on the knowledge and documentation of the clinical staff. If the information on the ACE Tracker is not accurate, it may be due to inadequate or missing documentation. In the process of improving the use of electronic health record tools, Aurora Health Care leaders have found opportunities to improve clinician documentation.

Communication is a vital component of the e-Geriatrician program. To enhance the communication and pilot new technologies, video conferencing was piloted at one site. It was not successful due to the complexity, video quality issues, logistics, and clinical staff not being comfortable with the medium.

The variables noted on the ACE Tracker are chosen based on previous literature showing an association with adverse outcomes. Further work is needed to address the predictive ability of the ACE Tracker for improved outcomes.

While the e-Geriatrician program is effective for the majority of patients, there are a few complex patients who may benefit from a formal (or video telemedicine geriatrics [8]) consult.

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