The Stanford Geriatric Trauma Care Pathway

A multi-disciplinary innovative pathway for improving clinical outcomes in hospitalized older adults

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Association Between Implementation of a Geriatric Trauma Clinical Pathway and Changes in Rates of Delirium in Older Adults With Traumatic Injury

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The Burden of Geriatric Trauma - Nationally

Geriatric Trauma care: need for improvement in clinical outcomes

- US population rapidly aging, projected to be 95 million by 2060 (23% of total population) (National Center for Health Statistics (NCHS) (2019) National Vital Statistic System)
- Trauma patients over age 65 years estimated to reach over 40% by 2050 (MacKenzie et al. (1990) J Trauma, Rzepka et al. (2001) J Clin Epidemiol)
- Prior work has shown that a multidisciplinary pathway for in frail older adults ≥65 yrs with trauma resulted in reduced delirium and 30d readmission rates (Bryant et al. (2019) J Am Coll Surg.)
The Burden of Geriatric Trauma – at Stanford Health Care

- Increase in Trauma Admissions - 24% increase in admissions 65 and older from FY17 to FY18.
- Approximately 45% of trauma admissions: in patients 65 or older
- Time-consuming, but nonoperative, problems
- Usually under-triaged
- Ground Level Falls - most common mechanism of injury
- High rates of ICU “bounce back”, complications (mortality, morbidity, complications, delirium, and worse functional status)
- High direct cost of care
- Margins on the geriatric population is narrow
  - Gains/loss for the older vs. the younger population:
    - $800,000 for those 65 and older
    - $35M for those younger than 65
  --Have to get it right
Develop a multi-disciplinary trauma care pathway for older adults incorporating the Age-Friendly Health Systems Initiative

Goals: Value Improvement, Culture Change, Advance Equity
SHC-Stanford Senior Care was Nationally Recognized by the IHI for Geriatric Trauma Work (Institute for Healthcare Improvement (2019))

- **Highest level of recognition** by the Age-Friendly Health System initiative
- Demonstrates our delivery age-friendly 4M care consistently and reliably (for a minimum of 6 months)
- Impressed by our process/ outcome measurement dashboard, they have selected Stanford as one of 18 institutions amongst 200+ participants, to be followed for an extended 18-month period to help us evaluate the ROI for our Geri-Trauma cohort
Integrating Age-Friendly Care (4Ms) in Geriatric-Trauma Care

**What Matters**

Know and align care with each older adult specific health outcome goals and care preferences including, but not limited to, end-of-life care, and across settings of care.

**Medication**

If medication is necessary, use Age-Friendly medication that does not interfere with What Matters to the older adult, Mobility, or Mentation across settings of care.

**Mentation**

Prevent, identify, treat, and manage dementia, depression, and delirium across settings of care.

**Mobility**

Ensure that older adults move safely every day in order to maintain function and do What Matters.

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**Recovery Milestones**

- PHASE A: ED
- PHASE B: Initial 24 hrs of Admission
- PHASE C: Recovery
- PHASE D: Discharge Milestones
- PHASE E: Post Discharge F/U

- Early mobility
- Pain Control
- Discharge Planning
- Early Nutrition
- Medication Management
- Personal Hygiene
- Safety
# AFHS 4M Care Definition – SHC Geriatric Trauma

<table>
<thead>
<tr>
<th>4Ms</th>
<th>Definition</th>
<th>Role</th>
<th>Frequency</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>What Matters</td>
<td>1. “What’s most important to you during this hospital stay?”</td>
<td>Geriatrics team</td>
<td>Once per stay for all and recurrent if needed</td>
<td>% receiving GOC note Time to complete first GOC note (Goal – 48 hrs)</td>
</tr>
<tr>
<td></td>
<td>2. HC proxy/ Surrogate</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>3. Previous Advance Directive</td>
<td></td>
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<tr>
<td>Medications</td>
<td>Screen home and current medication list for potentially inappropriate medications</td>
<td>Geriatrics team</td>
<td>Daily</td>
<td>Admission med rec within 48 hrs.</td>
</tr>
<tr>
<td>Mentation</td>
<td>Screen for Delirium by CAM</td>
<td>Nursing</td>
<td>Every shift</td>
<td>% of positive CAM and/or Delirium DRG code during admission.</td>
</tr>
<tr>
<td>Mobility</td>
<td>Screen for mobility and proactive ambulation</td>
<td>Rehab and Nursing and Daily</td>
<td># of hours (Time) to first mobility from admission.</td>
<td></td>
</tr>
<tr>
<td>Geriatric SPICES</td>
<td></td>
<td></td>
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<tr>
<td>-----------------</td>
<td></td>
<td></td>
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<tr>
<td><strong>Sleep Issues</strong></td>
<td>Initial: Do you have trouble falling asleep (longer than 30-45 minutes)? Do you sleep for &lt;4 hours at a time? Do you take a sleep aid regularly at home?</td>
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<tr>
<td></td>
<td>Hospital: How many hours did the patient sleep? Did they receive a sleep aid or antipsychotic overnight?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Pain/Polypharmacy</strong></td>
<td>Initial: Did you have pain before this hospitalization? What were you taking? What dose? How often?</td>
<td></td>
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<tr>
<td></td>
<td>Hospital: What was the last pain score? Is the patient on a scheduled pain medication regimen?</td>
<td></td>
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</tr>
<tr>
<td><strong>Immobility</strong></td>
<td>Initial: Did you come here because of a fall? Were you able to bathe, groom, toilet, walk and eat independently at home?</td>
<td></td>
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<tr>
<td></td>
<td>Hospital: Has the patient been out of bed in the last 12 hours? Do they have a mobility order? Can they go outside their room with assistance (would need order okay to go off monitor, for example)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Confusion/Constipation</strong></td>
<td>Initial: Does patient have trouble remembering appointments or family gatherings? Writing checks or paying bills? Shopping independently? Is there a diagnosis of dementia or cognitive impairment in the outpatient chart?</td>
<td></td>
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<tr>
<td></td>
<td>Do you struggle with constipation at home? Do you take something to help you have regular bowel movements?</td>
<td></td>
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<tr>
<td></td>
<td>Hospital: Is CAM positive? What is SIS score? Remember to complete the “Six Item Screen” only when/if CAM negative, complete “Six Item Screen” only once per hospitalization</td>
<td></td>
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<tr>
<td></td>
<td>When was the last bowel movement? Was it large or small? Is the patient having urinary retention?</td>
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<tr>
<td><strong>Enteral Nutrition</strong></td>
<td>Initial: Have you lost weight recently, such that your clothes fit differently? Any trouble chewing or swallowing?</td>
<td></td>
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<tr>
<td></td>
<td>Hospital: What type of diet is ordered? What percentage of meals has patient eaten? Do they need supplements?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social Support/ Sensory (caregiver issues, dispo plan, goals)</strong></td>
<td>Initial: Does someone help you regularly at home? Who? (for caregiver) Has the patient been needing more daily help in the past 3-6 months?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Hospital: Has there been a family member of caregiver at bedside? Will they be taking care of the patient after discharge? What are your concerns (RN)?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Milestones to developing SHC Geriatric Trauma Care Pathway

- First initiatives:
  - Targeted Geriatric Trauma Consults (2016)
  - Geriatric Trauma order sets (2017)
  - Pilot ACE unit 300P on C2 (2017)
  - Was not sufficient→Created the Geriatric Trauma Care Pathway (2018)
  - Geriatric Emergency Department (2019)
  - Age-Friendly Health Systems IHI Collaborative (2019)*
  - ACE unit 500P (January 2021)
Stanford Geriatric Trauma Initiatives

Pilot Data:
Started with Targeted Geriatrics Consultations

**October 2016**

GT65 Screen - High-risk screening tool done by Trauma service at 24 hours during the Tertiary survey.

1. Geriatrics to consult on those who screen positive.
2. Process compliance ~ 50-60%
3. Observations:
   - Geriatrics team consulted in 90% plus cases.
   - 23% had delirium
   - 50% had cognitive impairment (nursing engagement)
   - 70% had medication change recs (order set opportunities)

### Stanford Geriatric Trauma Screen (GT65)

<table>
<thead>
<tr>
<th>Screening Question</th>
<th>Suggested Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In general, do you have problems with your memory? (Yes/No)</td>
<td>GT consult for cognitive evaluation</td>
</tr>
<tr>
<td>2. Before this injury, did you need someone to help you with daily activities</td>
<td>PT consult for functional assessment</td>
</tr>
<tr>
<td>(such as bathing or dressing) on a regular basis? (Yes/No)</td>
<td></td>
</tr>
<tr>
<td>3. Do you live alone and not have someone you can count on to help you when you</td>
<td>Discuss discharge plans with Social Work</td>
</tr>
<tr>
<td>need help? (Yes/No)</td>
<td></td>
</tr>
<tr>
<td>4. Have you been in the hospital twice or more in the last year? (Yes/No)</td>
<td>Discuss discharge plans with Case Manager</td>
</tr>
<tr>
<td>5. Have you recently lost weight such that your clothing has become looser?</td>
<td>Nutrition consult &amp; alert PCP for possible further w/u</td>
</tr>
<tr>
<td>(Yes/No)</td>
<td></td>
</tr>
<tr>
<td>6. Do you take 5 or more prescription medications on a regular basis? (Yes/No)</td>
<td>Transition of care pharmacist at discharge</td>
</tr>
<tr>
<td>7. Do you often feel sad or depressed? (Yes/No)</td>
<td>Consider social work consult and/or screen with PHQ-9; Alert PCP</td>
</tr>
<tr>
<td>8. Do you have more than 2 drinks containing alcohol per day? (1 drink/day for</td>
<td>CIWA order sut; social work consult</td>
</tr>
<tr>
<td>women) (Yes/No)</td>
<td></td>
</tr>
<tr>
<td>9. Have you had a fall with injury in the last 3 months (including current reason</td>
<td>Discuss Fracture to Falls referral with case manager</td>
</tr>
<tr>
<td>for admission)? (Yes/No)</td>
<td></td>
</tr>
<tr>
<td>10. CAM positive on nursing flowsheet? (Yes/No)</td>
<td>Delirium order set (IP 3 Delirium)</td>
</tr>
</tbody>
</table>
Targeted Geriatrics Consultation

**October 2016**

- Frailty screening led by Trauma service during Tertiary survey – GT65 Screen

1. **Geriatrics to consult those who screen positive.**

2. Observations:
   - 23% had delirium
   - 50% had cog impairment
   - 70% had Med changes recommended

Geriatric Specific Order sets

**May 2017**

1. **Admission order sets:**
   Trauma admission order sets reviewed and updated for senior-friendly pharma and non-pharma interventions

2. **Elderly Rib Fracture pain Mx protocol**
   - Standardized pain evaluation and management protocols created by Pain service, Geriatrics and Trauma.

Acute Care for Elders Unit (Trauma)
Teamwork
Est 2017/2018

Multi-disciplinary steering committee formed representing:
• Trauma, Geriatric medicine
• Emergency Department (ED)
• Critical Care
• Nursing
• Physical and occupational therapy
• Speech and language pathology
• Case management and social work
• Pharmacy
• Nutrition
• Transitional care
• High Value Quality and Analytics teams
• Members of the patient family advisory council
Establishing the Geriatric Trauma Pathway Guidelines

• Used Design Process: Current state process mapping was done that included the patient continuum from the ED through discharge, and barriers to consistency in care were identified.

• From this, opportunities to employ evidence-based geriatric principles and processes were identified. An Age-Friendly Health System 4M care framework was used to prioritize interventions. A care pathway was designed incorporating all of these features.
Establishing the Geriatric Trauma Pathway Guidelines

Necessary electronic health record (EHR) and workflow needs were identified to support the pathway:

– Order sets
– Automatic multi-disciplinary consults (including geriatric medicine, physical and occupational therapy, case management, nutrition services, case management, and rehabilitation (OT/PT) services)
– Documentation requirements
– Escalation algorithms (how to manage expected and common symptoms like pain management, bowel and sleep regulation)

The Geriatric Medicine services were similarly standardized. A baseline frailty screen was to be performed on admission and includes cognition, function, social and polypharmacy assessments.
Establishing the Geriatric Trauma Pathway Guidelines

• A multi-disciplinary team meeting is done daily during the week on the non-ICU trauma unit with the geriatric clinician

• Prior to discharge, a transitional care team is consulted if deemed appropriate for post discharge follow-up or home visit.

• Those presenting with a ground level fall as the cause for injury, are provided with a fall prevention program ‘Farewell To Falls’ post-discharge for secondary fall prevention (described elsewhere). [needs reference]
Geriatric Trauma Care Pathway Dashboard (updated monthly)
Geriatric Trauma (Non-Surgical) Care Path

Frequently Asked Questions

Does the pathway apply to all patients?

✓ The following cases will be excluded from the care path: All major surgical procedures
✓ Following cases will be flagged as “Off the target LOS”: Insertion of pacemaker & defibrillator, Cardiac assist device- IABP, ECMO, VAD, patients on hemodialysis or CRRT, prolonged vent>24 hrs

Where to find the Geriatric Trauma Non-Surgical Care Pathway?

✓ The Care Path link is available here:
  Geriatric Trauma Non-Surgical Pathway
✓ The link is also available for reference in Epic (see screenshots below) and in order sets.

Which order set to use?

✓ The following order sets are updated and are available to use in Epic:
  o IP SUR General Admit
  o IP GEN/ICU Rib Fracture
Standardized EPIC Documentation

### Pain Assessment
- Pain Scale Type
- Pain Scale Instruction
- Pain Level - 1st Site
- Pain Goal
- Anxiety Level
- Does Patient Have Chronic Pain

### Pulmonary
- Pulmonary (WDL)
- Incentive Spirometer (ml)
- Deep Breathing
- Flutter Valve

### Mobility/Activity
- Mobility/Activity
- Bed Position
- Patient Position
- # of Siderails Up
- Therapy Bed Surface
- Pressure Redistribution/Off-loading Devices
- Bedside Mobility Level (BMAT)

### Sleep Pattern
- Sleep Pattern
- Hours of Sleep
Clinical Question

Is the establishment of a geriatric-centered clinical pathway associated with improved outcomes for injured older adults?
Study Design

Retrospective Case-control (2018-2020)

Setting: Stanford University Hospital

Population:
- Injured Older adults Age 65 and above
- Admitted to Trauma service but received non-operative treatment

Intervention:
- Implementation of a geriatric medicine-based multi-disciplinary clinical pathway

Outcomes:
- Primary: Delirium
- Secondary: hospital length of stay (LOS), process measures
Geriatric Trauma Pathway: key elements

- Medications
- What Matters
- Nutrition
- Pain
- Bowel/Bladder
- Mentation
- Mobility
- Discharge Planning

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Multi-disciplinary team

Geriatric Medicine
Trauma Surgery
Case Management
Social Work
Pharmacy
Speech Therapy
PT/OT Rehab
Nursing
Pain
Patient & Caregivers
Analysis

Excluded patients who had surgical operations as other pathways might interfere with results.
# Table 1

Baseline characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Postimplementation</td>
<td>P value for difference</td>
<td></td>
</tr>
<tr>
<td>No. (%)</td>
<td>442 (62.1)</td>
<td>270 (37.9)</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Demographic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>247 (55.9)</td>
<td>147 (54.4)</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>194 (43.9)</td>
<td>123 (45.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>81.8 (9.3)</td>
<td>81.6 (8.8)</td>
<td>.91</td>
<td></td>
</tr>
<tr>
<td>Age categories, y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70</td>
<td>60 (13.6)</td>
<td>31 (11.5)</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>71-80</td>
<td>132 (29.9)</td>
<td>82 (30.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81-90</td>
<td>158 (35.7)</td>
<td>100 (37.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;90</td>
<td>92 (20.8)</td>
<td>57 (21.1)</td>
<td></td>
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</tbody>
</table>

### Table 1. Characteristics of the Baseline and Postimplementation Cohorts

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Postimplementation</td>
<td>P value for difference</td>
<td></td>
</tr>
<tr>
<td>Race and ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>86 (19.5)</td>
<td>44 (16.3)</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>269 (60.9)</td>
<td>182 (67.4)</td>
<td></td>
<td></td>
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<tr>
<td>Other*</td>
<td>87 (19.7)</td>
<td>44 (16.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-English speaking</td>
<td>75 (17.0)</td>
<td>40 (14.8)</td>
<td>.45</td>
<td></td>
</tr>
<tr>
<td>English speaking</td>
<td>367 (83.0)</td>
<td>230 (85.2)</td>
<td></td>
<td></td>
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<tr>
<td>Injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mechanism</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fail</td>
<td>247 (55.9)</td>
<td>162 (60.0)</td>
<td>.43</td>
<td></td>
</tr>
<tr>
<td>MVC</td>
<td>34 (7.7)</td>
<td>18 (6.7)</td>
<td></td>
<td></td>
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<tr>
<td>Bicycle</td>
<td>21 (4.8)</td>
<td>6 (2.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other or missing</td>
<td>140 (31.7)</td>
<td>84 (31.1)</td>
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<tr>
<td>ISS*</td>
<td></td>
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<tr>
<td>&lt;9</td>
<td>78 (17.6)</td>
<td>50 (18.5)</td>
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<td></td>
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<tr>
<td>9-15</td>
<td>183 (41.4)</td>
<td>118 (43.7)</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>&gt;15</td>
<td>58 (13.1)</td>
<td>33 (12.2)</td>
<td></td>
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</tbody>
</table>
Table 2

Unadjusted Clinical Outcomes

<table>
<thead>
<tr>
<th>Clinical outcome</th>
<th>No. (%)</th>
<th>Postimplementation</th>
<th>( P ) value for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. (%)</td>
<td>442 (62.1)</td>
<td>270 (37.9)</td>
<td>NA</td>
</tr>
<tr>
<td>Delirium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>125 (28.3)</td>
<td>50 (18.5)</td>
<td>.002</td>
</tr>
<tr>
<td>By ISS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS &lt;15</td>
<td>69 (15.6)</td>
<td>23 (8.5)</td>
<td>.001</td>
</tr>
<tr>
<td>ISS &gt;15</td>
<td>56 (12.7)</td>
<td>27 (10.0)</td>
<td>.26</td>
</tr>
<tr>
<td>LOS, mean (SD), d</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>4.3 (3.8)</td>
<td>4.3 (2.9)</td>
<td>.20</td>
</tr>
<tr>
<td>By ISS(^a)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS &lt;15</td>
<td>3.9 (2.9)</td>
<td>3.9 (2.3)</td>
<td>.95</td>
</tr>
<tr>
<td>ISS &gt;15</td>
<td>5.0 (4.8)</td>
<td>4.9 (3.7)</td>
<td>.28</td>
</tr>
</tbody>
</table>

Abbreviations: ISS, Injury Severity Score; LOS, length of stay; NA, not applicable.

\(^a\) For statistical analysis, injury severity was dichotomized into minor or moderate (ISS <15) and severe injury (ISS >15) (ISS range, 0-75; \( \geq 16 \) indicates serious overall injury).
**Unadjusted Outcomes: Mortality data**  
*(not reported in published study for cell sizes <10)*

### Table 2: Unadjusted Clinical Outcomes

<table>
<thead>
<tr>
<th>Clinical Outcomes</th>
<th>Baseline</th>
<th>Post-Implementation</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number or Mean</td>
<td>% or SD</td>
<td>Number or Mean</td>
</tr>
<tr>
<td></td>
<td>442</td>
<td>62.1%</td>
<td>270</td>
</tr>
<tr>
<td>Death</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>22</td>
<td>5%</td>
<td>6</td>
</tr>
<tr>
<td>By ISS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS &lt; 15</td>
<td>7</td>
<td>1.6%</td>
<td>0</td>
</tr>
<tr>
<td>ISS &gt; 15</td>
<td>15</td>
<td>3.4%</td>
<td>6</td>
</tr>
<tr>
<td>Delirium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>125</td>
<td>28.3%</td>
<td>50</td>
</tr>
<tr>
<td>By ISS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS &lt; 15</td>
<td>69</td>
<td>15.6%</td>
<td>23</td>
</tr>
<tr>
<td>ISS &gt; 15</td>
<td>56</td>
<td>12.7%</td>
<td>27</td>
</tr>
<tr>
<td>LOS (days)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>4.3</td>
<td>3.8%</td>
<td>4.3</td>
</tr>
<tr>
<td>By ISS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISS &lt; 15</td>
<td>3.9</td>
<td>2.9%</td>
<td>3.9</td>
</tr>
<tr>
<td>ISS &gt; 15</td>
<td>5.0</td>
<td>4.8%</td>
<td>4.9</td>
</tr>
</tbody>
</table>

SD Standard Deviation; ISS Injury Severity Score; LOS length of stay
## Adjusted Outcomes
(Mortality data not reported in published manuscript)

Table 3: Summary of Regression Results, Post-Implementation vs. Baseline

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Odds Ratio or Coefficient</th>
<th>P Value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delirium</td>
<td>0.53</td>
<td>&lt;0.001</td>
<td>0.11 - 2.65</td>
</tr>
<tr>
<td>Mortality</td>
<td>0.27</td>
<td>0.02</td>
<td>0.09 - 0.81</td>
</tr>
<tr>
<td>LOS (days)</td>
<td>-0.55</td>
<td>0.44</td>
<td>-1.96 - 0.85</td>
</tr>
</tbody>
</table>

Variables included in models include age, race, sex, injury severity, mechanism of injury, and process measures (pain, mobility, goals of care). English language included as variable for delirium regression.
Effect by Cohort

Figure. Percent Reduction in Delirium for Postimplementation and Baseline Cohorts

- Age, y
  - <80
    - Baseline
    - Postimplementation
  - ≥81
    - Baseline
    - Postimplementation

- Sex
  - Female
    - Baseline
    - Postimplementation
  - Male
    - Baseline
    - Postimplementation

- Mechanism
  - Fall
    - Baseline
    - Postimplementation
    - a: p <0.05
  - Nonfall
    - Baseline
    - Postimplementation

- ISS
  - <15
    - Baseline
    - Postimplementation
  - >15
    - Baseline
    - Postimplementation

a: p <0.05
Significant Reduction in Delirium also observed in **English-speaking** subgroup (not reported in published manuscript)
## Process Metric Outcomes

### Table 4. Process Metric Outcomes

<table>
<thead>
<tr>
<th>Process metric outcome</th>
<th>Mean (SD)</th>
<th>Postimplementation</th>
<th>P value for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. (%)</td>
<td>442 (62.1)</td>
<td>270 (37.9)</td>
<td>NA</td>
</tr>
<tr>
<td>Pain control (first 24 h)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain score&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.5 (1.7)</td>
<td>2.2 (1.9)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Pain score of 4 or higher</td>
<td>50 (11.3)</td>
<td>54 (20.0)</td>
<td>.001</td>
</tr>
<tr>
<td>Timing of first mobilization (if LOS &gt;2 d)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours to first ambulation</td>
<td>32.4 (24.2)</td>
<td>27.6 (20.8)</td>
<td>.11</td>
</tr>
<tr>
<td>Goals of care (if LOS &gt;2 d)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Had a goals of care discussion</td>
<td>74 (16.7)</td>
<td>145 (53.7)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Hours to first goals of care discussion</td>
<td>49.6 (105.5)</td>
<td>35.7 (25.3)</td>
<td>.03</td>
</tr>
</tbody>
</table>

<sup>a</sup> Pain score includes all patients who reported pain during the first 24 hours.
### Table 4a: Risk-Adjusted Major Hospital Events Including Death by Reporting Period and Cohort

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Spring 2018</th>
<th>Fall 2018</th>
<th>Spring 2019</th>
<th>Fall 2019</th>
<th>Spring 2020</th>
<th>Fall 2020</th>
<th>Spring 2021</th>
<th>Fall 2021</th>
<th>Spring 2022</th>
<th>Fall 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Patients</td>
<td>0.79</td>
<td>0.81</td>
<td>0.80</td>
<td>0.86</td>
<td>1.00</td>
<td>NA</td>
<td>0.81</td>
<td>0.79</td>
<td>0.71</td>
<td>0.75</td>
</tr>
<tr>
<td>Blunt Multisystem</td>
<td>0.87</td>
<td>1.06</td>
<td>0.88</td>
<td>1.02</td>
<td>1.25</td>
<td>NA</td>
<td>0.80</td>
<td>0.76</td>
<td>0.70</td>
<td>0.74</td>
</tr>
<tr>
<td>Penetrating</td>
<td>0.98</td>
<td>0.92</td>
<td>0.85</td>
<td>0.93</td>
<td>0.97</td>
<td>NA</td>
<td>1.41</td>
<td>1.36</td>
<td>1.07</td>
<td>1.18</td>
</tr>
<tr>
<td>Shock</td>
<td>1.12</td>
<td>0.96</td>
<td>0.92</td>
<td>0.98</td>
<td>1.09</td>
<td>NA</td>
<td>1.00</td>
<td>0.93</td>
<td>0.90</td>
<td>1.03</td>
</tr>
<tr>
<td>Severe TBI</td>
<td>0.92</td>
<td>0.82</td>
<td>0.78</td>
<td>1.17</td>
<td>1.03</td>
<td>NA</td>
<td>0.99</td>
<td>0.85</td>
<td>0.74</td>
<td>0.78</td>
</tr>
<tr>
<td>Elderly</td>
<td>0.86</td>
<td>0.99</td>
<td>1.00</td>
<td>0.99</td>
<td>0.96</td>
<td>NA</td>
<td>0.76</td>
<td>0.68</td>
<td>0.66</td>
<td>0.76</td>
</tr>
<tr>
<td>Elderly Blunt Multisystem</td>
<td>1.02</td>
<td>1.15</td>
<td>1.05</td>
<td>1.13</td>
<td>1.23</td>
<td>NA</td>
<td>0.88</td>
<td>0.81</td>
<td>0.75</td>
<td>0.89</td>
</tr>
<tr>
<td>Isolated Hip Fracture</td>
<td>1.09</td>
<td>0.90</td>
<td>0.91</td>
<td>0.93</td>
<td>1.01</td>
<td>NA</td>
<td>0.92</td>
<td>0.96</td>
<td>1.09</td>
<td>1.05</td>
</tr>
</tbody>
</table>
Run Chart Delirium

Positive CAM-FLG - number

UCL
CL
LCL

0.000 0.100 0.200 0.300 0.400 0.500 0.600 0.700


CL

0.22

0.31

0.13

Staudenmayer, K.L.
Summary & Conclusions

• The Stanford Geriatric-Trauma Care Pathway reduced delirium and mortality in injured older adults
• Mortality and delirium benefits were accrued most to those with ISS<15
• Reductions in rates of delirium more common based on demographics, specifically sex and primary language—pointing to areas that require closer attention
• Pain scores were higher in the post-implementation period (may reflect change in how pain was assessed)
Summary of outcomes

• Single-center, Streamlined, Multi-disciplinary clinical care pathway **improves outcomes** in injured older adults

• **Significant reductions** observed in multiple outcomes:
  - Delirium
  - Length of stay
  - Time to discussion and documentation of Goals of care (GOC) conversation

• **Significant Reduction in delirium especially in**
  - Female, English-speaking
  - Admitted with Fall, ISS <15
Conclusions

- First study to implement of Geriatrics-centered care of older adults with trauma incorporating Age-friendly 4M healthcare system
- **Novelty** lies in the wide breadth of elements included
- Inclusive population of older adults above age 65 instead of pre-selecting those at high-risk
- Findings consistent with previous reports showing improved outcomes of geriatric-focused interdisciplinary trauma care pathways
- Mortality and delirium benefits were accrued most to those with ISS<15

- **Limitation**: population mainly Caucasian, English-speaking
Future Directions

• Reductions in rates of delirium more common based on demographics, specifically sex and primary language—pointing to areas that require closer attention

• Pain scores were higher in the post-implementation period (may reflect change in how pain was assessed)

• Streamlined geriatric-centered trauma care of older adults → expand this model pathway in other trauma centers across the nation
References cited

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