The Elderly Patient and Trauma –Its More than Broken Hips

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Disclosures

- I have no disclosures

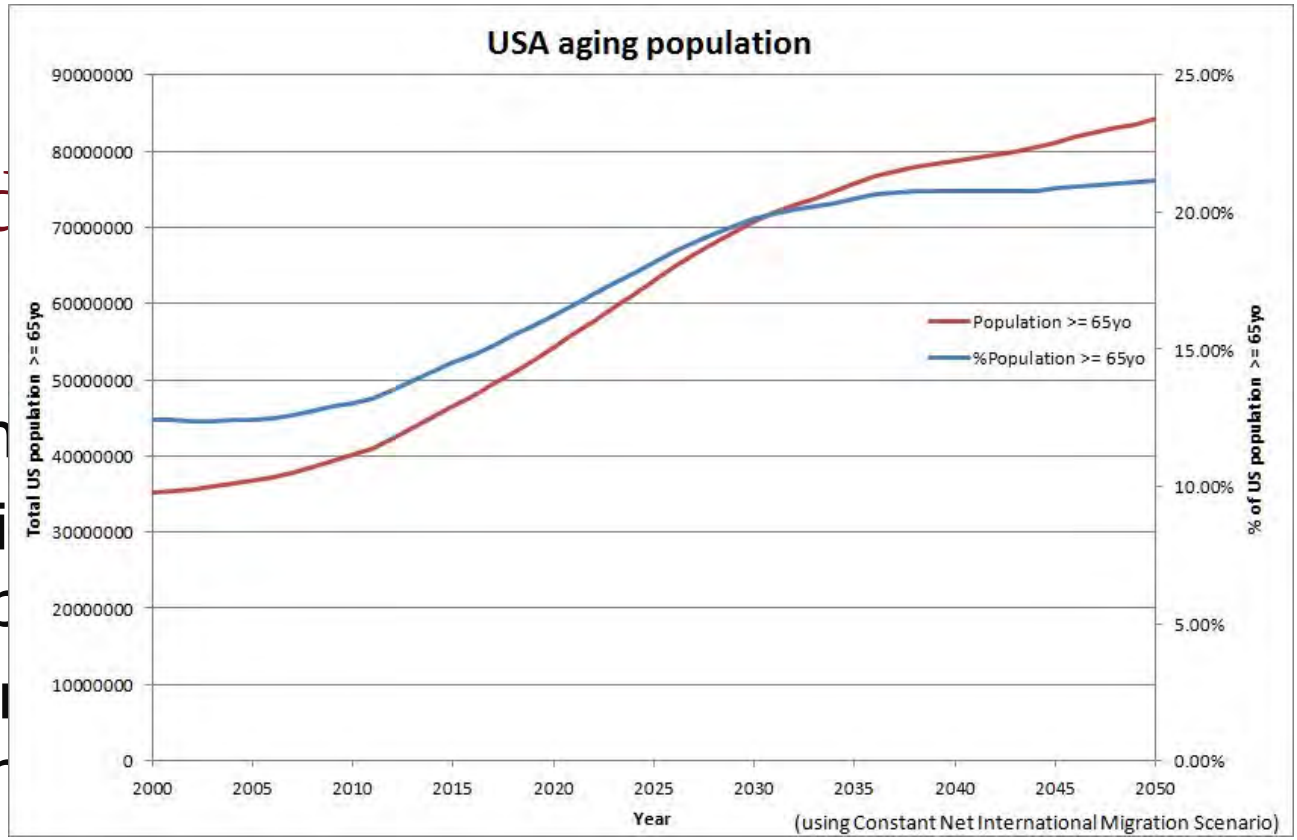
The Elderly Patient: Introduction

- Epidemiology
- Mechanisms
- Triage and evaluation
- Physiology
- Surgical Patients
- Creating a Geriatric Trauma Service

The Elderly Patient

- First: The age question, what is elderly?
- Many articles say 65
- Trauma mortality increases at age 55
- Will generally use 65 as the age for the purpose of this talk
- 23% of adult trauma population is 65 or older
- By 2050, 90 million will be over 65, 1/5 of the adult population

Elderly: Epid

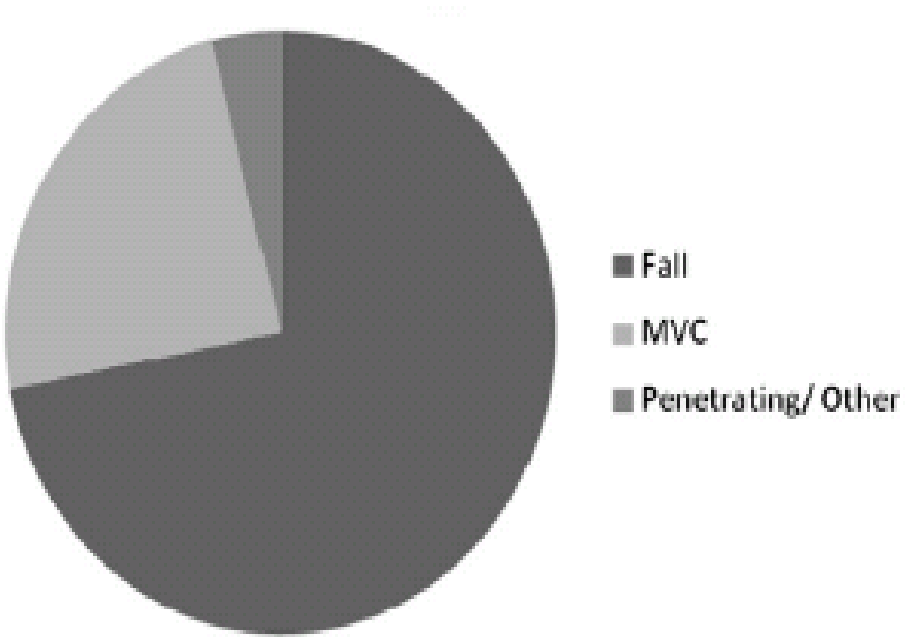


- Adult lifespan
- Multiple studi
  the aging pop
- The CDC esti
  age will reach
  2030.
- We will need to continue to adapt and learn to improve care for these patients as we did for penetrating violence in the 90's or more recently from military conflicts.

Elderly: Epidemiology

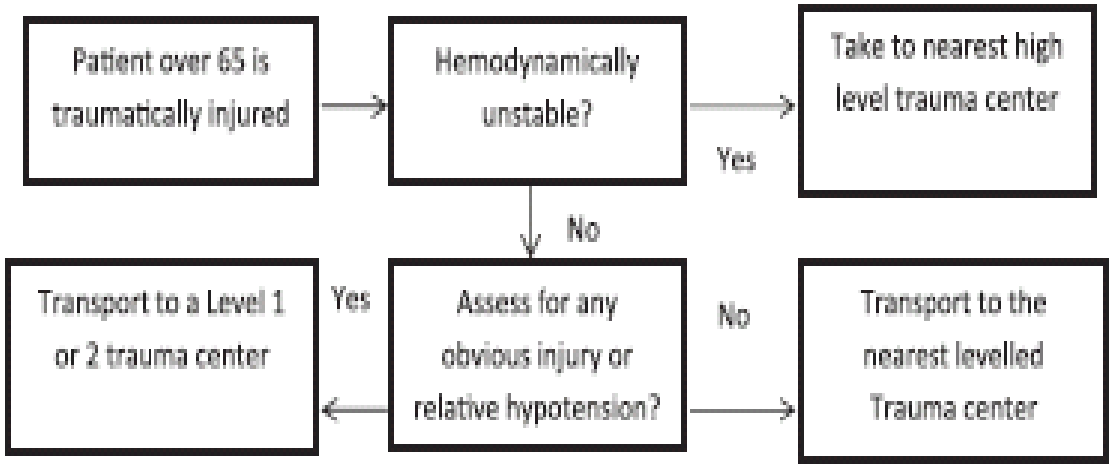
- The elderly are more active
- They are driving more miles in cars
- They have greater accessibility given other mobility devices

Mechanisms of Trauma

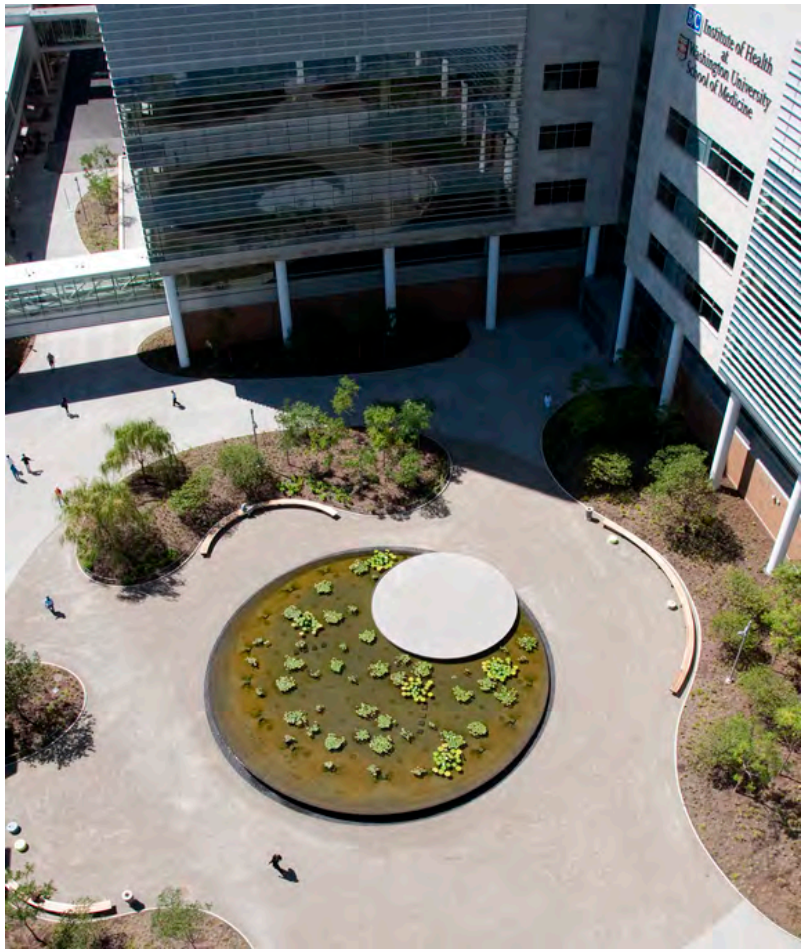


Triage

- Geriatric morbidity and Mortality in trauma increases at age 55
- Geriatric patients treated at higher level trauma centers do better.



Physiology/ Comorbidities



- 50% have hypertension
- 39% have heart disease
- All of the following occur more than 10%
  - Diabetes
  - CVA
  - COPD
  - Dementia
  - Arrhythmias
  - Endocrine disorders
- Most also have decreased FRC, thus desaturate more quickly

Table 1
Physiologic and functional preexisting differences in the older adult

Organ System	Normal	Potential Differences in the Older Patient
Vital signs	Increased mortality if HR >130 beats/min or SBP <95 mm Hg	Increased mortality if HR >90 beats/min or SBP <110 mm Hg
Neurologic	No baseline deficits	Baseline deficits (dementia, stroke, hearing loss) Report less pain for equivalent injuries, potentially limiting injury discovery
Cardiovascular	No baseline deficits, no hypertension No cardiac medications	Baseline hypertension Medications that affect blood pressure and heart rate (β-blocker, calcium-channel blocker, amiodarone) History of heart failure
Pulmonary	Normal functional residual capacity Potential smoker	Decreased functional residual capacity Chronic obstructive pulmonary disease
Renal	Normal renal function	Decreased glomerular filtration rate
Coagulation	Normal coagulation status	On blood-thinning medications including ASA, warfarin, and platelet inhibitors
Skeletal	Normal bone density	Osteoporosis, leading to easier fracture rate
Medications	Minimal medications	Polypharmacy that can change mental, hemodynamic, renal, and coagulation status

Abbreviations: ASA, acetylsalicylic acid; HR, heart rate; SBP, systolic blood pressure.

Physiology/ Comorbidities

- Appropriate medications cause issues:
  - BB and Ca channel blockers blunt the normal tachycardic response to poor perfusion
  - Anticoagulants from ASA to direct thrombin inhibitors make bleeding risks higher.
  - Steroids for COPD limit wound healing
  - Antipsychotics and dementia lead to post op issues
- Inappropriate medication
  - Often polypharmacy including narcotics, benzos, and anticoagulants that have not been appropriately terminated

Physiology – Practical Issues

- Patients can have major injuries with minor trauma
  - Head bleeds
  - Splenic laceration
  - Fractures, not just hips – especially ribs
- With more frail tissues, patients develop wounds quicker
- Spine deformities are more prevalent
- So limit backboard use
- They will desaturate quicker on intubation
- They will respond poorly to benzodiazepams
- Their pressures are bassline higher so must be kept higher after injury

Rib Fracture Triage

- 2 points:
  - Age ≥ 60yo
- 1 point:
  - ≥ 3 rib fractures
  - Bilateral rib fractures
  - Flail segment
  - IS <500ml
  - Weak or no cough
  - Underlying chronic lung disease

- If ≥3 points-admit pt to the SICU and consult pain for an epidural

- If ≥2 points- consider admission to the OU and early pain consult for an epidural

Emergent Surgical Patients

- Many procedures in the elderly population are urgent or emergent.
- Most trauma operations are not elective, even if not emergent.
- Minimal work up is often all that is needed.

Screen for Non-Elective cases

- Acute cardiac disease
  - Unstable or severe angina
  - Myocardial infarction within 1.5 months
  - New or worsening heart failure symptoms
  - Significant arrhythmias
  - Severe valve stenosis.
- The above require a more thorough workup and possible cardiology consult. However, this is for risk assessment and OR planning, not to stop cases.

Screen for Non-Elective cases

- Targeted labs and tests
  - Basic labs – CBC; BMP; T&S or T&C per procedure, others per symptoms or medications
  - ECG
  - CXR – suspicion for CHF, dyspnea, PNA, hypoxia
  - TTE – evaluate CHF with worsening symptoms, evaluation of an new/undiagnosed murmurs, reevaluation of known significant valvular disease (moderate or greater) if no recent study available (within 2 years)
- Continue/restart home medications ASAP
- Retrieval of records from most recent cardiac evaluation
- Cardiac devices – must determine brand and type and interrogate if > 3 months

Geriatric Trauma Service

- How can we continuously improve care for such patients?

Introduction

- Our trauma service was not satisfied with the care of the older injured patient

- Factors that we reviewed included:

- TQIP data that revealed we may be an outlier in isolated hip fractures
- Individual patient reviews that revealed what we considered fragmented care
- An ACS review that noted some issues with improving geriatric care

Introduction

- At our center, all multiply injured patients with significant injury pre and post intervention were admitted to the Trauma service, regardless of age.

- Single system isolated injuries were admitted to various services depending on PCP and ED consultation
  - Isolated hip fracture admitted to orthopedics or a medicine service
  - Small ICH with normal GCS admitted to neurosurgery, neurology, or medicine.

Introduction

- Using this information we approached hospital and Department of Surgery leadership to develop a plan to improve the care of the geriatric patient.

- A decision was made to identify areas of concern and to design and implement a Geriatric Trauma Service (GTS) to address those issues.

Issues Identified on Review

- No protocol on where to admit minor to moderately injured geriatric patients
- No consistent admitting service, resulting in some patients transferred services multiple times
- Inadequate therapy (OT and PT) resources to ensure rapid assessment and placement of patients after required medical care with even less availability on weekends
  - There was a much higher therapy intensity available on the joint replacement service floor
- No protocol for standard preoperative evaluation. Instead, medicine, hospitalists, and anesthesia providers differed significantly and resulted in case cancellations

Issues Identified on Review

- Inadequate resident coverage to care for these patients on the main Trauma service
- No standard protocols for postoperative care
- No standard for medication review or follow up with the patients' primary care providers (PCP)
- Floor based social worker teams that created multiple handoffs between social workers as patients moved from ICU to the floor

Introduction

- Our study aim was to assess the effectiveness of the new GTS as measured by mortality and length of stay

Methods - Implementation

- Hired and trained 3 nurse practitioners to run the service during the day
- Dedicated ICU trained trauma attending to round on patients daily
- Hired more PT/OT and changed shifts to ensure a robust therapy intensity
- Changed SW model to team instead of floor based model, ensuring less handoffs of these patients
- Floor based nursing education on geriatric patients
- Changed triage criteria for those over 54 to ensure trauma attending consultation before admission, ensuring correct admitting service
- Developed standard treatment protocols

Methods - Implementation

- Beers medication review of home meds for every patient
  - Review for potentially inappropriate medications
  - Benzodiazipams, narcotics, sedatives, and blood thinning medications removed most
  - Adjustments for renal failure
- Developed protocols with anesthesia for standard and efficient work up for these patients
- Contacted PCPs for every patient that had one, and helped to find one for those that do not

Methods - Implementation

Geriatric Trauma service admission criteria

- 55 or older
- Single system or multisystem low to moderate severity

Methods –Study Design

- Pre-Post, time interrupted series with retrospective review of prospectively collected trauma database

- Pre GTS control group – All trauma patients ≥ 55 admitted to Neurosurgery, Orthopedics, or Medicine in 2012

- Post GTS experimental group – All trauma patients ≥ 55 admitted to the GTS for 15 months after implementation of the GTS, October 2013 through December 2014

There was a 9 month implementation phase between groups while all elements of the GTS were implemented.

Results – Patient Numbers

Team	Pre GTS		Post GTS	
GTS	NA		**798**	
Trauma	343		449	
Non Trauma	**652**		392	
Neurosurgery		221		203
Orthopedics		281		121
Medicine		150		68
Totals	995		1247	

Results - Demographics

	Pre GTS	Post GTS	p value
Mean age (years)	74.1	77.2	**<.0001**
Gender (M/F, %)	245/433, 36%	240/414, 37%	NS
ISS	9.54	8.8	NS
AIS Head	1.23	0.81	**<.0001**
AIS Face	0.13	0.14	NS
AIS Chest	0.16	0.36	**<.0001**
AIS Abdominal	0.05	0.16	**<.0001**
AIS Extremities	1.45	1.6	**0.0428**
# of comorbidities	21.1	21.33	NS

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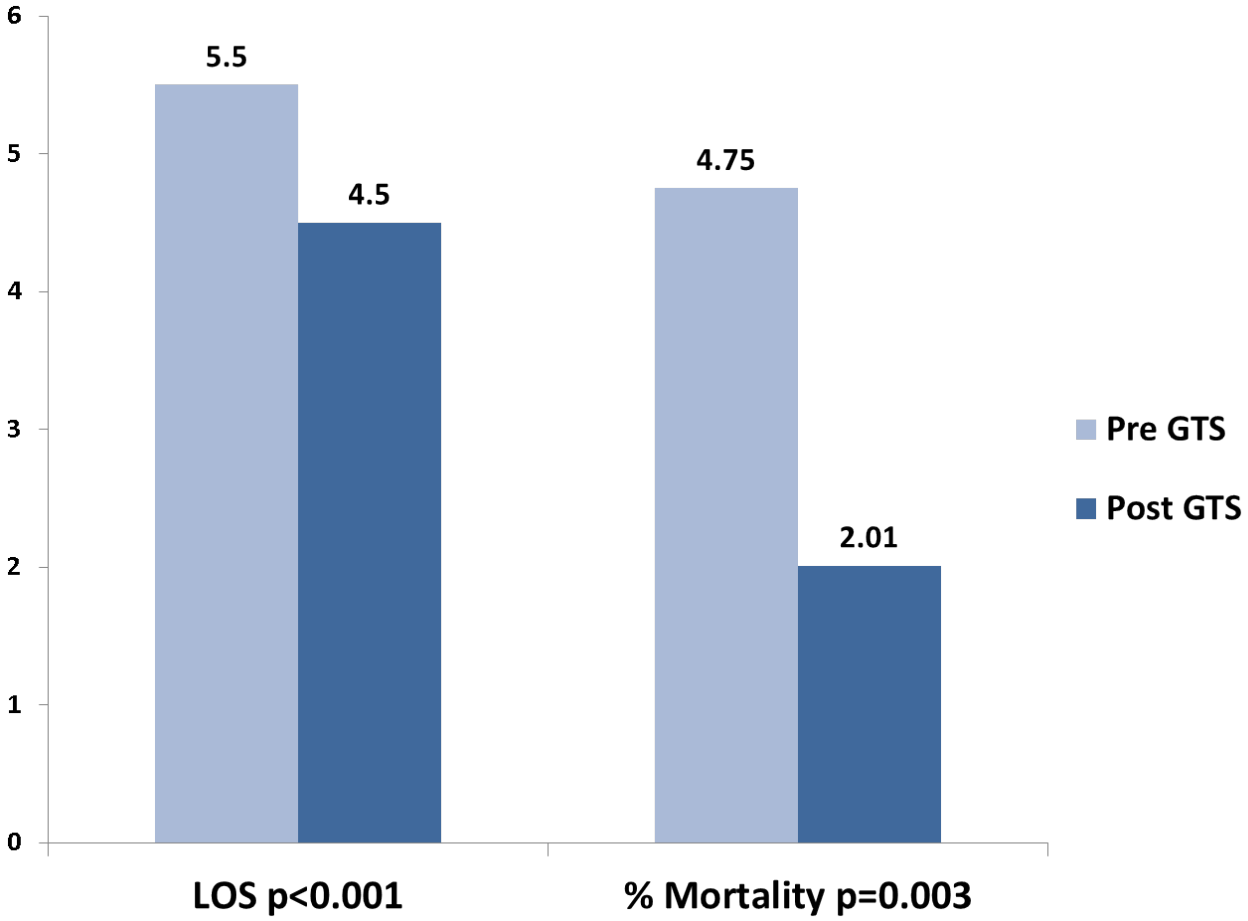
Results Mortality and LOS



Mortality Logistic Regression

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
AGE	1.011	0.985	1.038
Comorb	**1.019**	**1.001**	**1.037**
Pre vs Post GTS	**0.506**	**0.263**	**0.972**
AIS_Head	**3.231**	**1.330**	**7.850**
AIS_Face	2.066	0.908	4.701
AIS_Chest	1.140	0.417	3.115
AIS_Abdominal	0.626	0.078	5.026
AIS_Extremities	0.582	0.232	1.462
AIS_External	0.695	0.356	1.355

GTS, p=0.04, AIS Head, p=0.01, Comorb, p=0.04

Length of Stay - Linear Regression

Variable	Parameter Estimate	Standard Error	p value
AGE	-0.00084	0.01267	NS
AIS_Head	**0.42181**	**0.12905**	**0.0011**
AIS_Chest	**0.73959**	**0.19453**	**0.0001**
AIS_Abdominal	0.34305	0.3009	NS
AIS_Extremities	**0.801**	**0.15244**	**<.0001**
Pre vs Post GTS	**-1.0587**	**0.30098**	**0.0004**

Results – Non GTS Patients

Service		Pre GTS	Post GTS		Pre GTS	Post GTS	
		ISS	ISS		LOS	LOS	
All Non Trauma		9.5	10	p=NS	5.5	5.0	p=NS
	Neurosurgery	14.1	14.6	p=NS	5.1	5.8	p=NS
	Orthopedics	7.4	6	P<0.001	5.1	3.9	p=0.046
	Medicine	6.8	6	P=0.041	6.7	4.9	p=NS

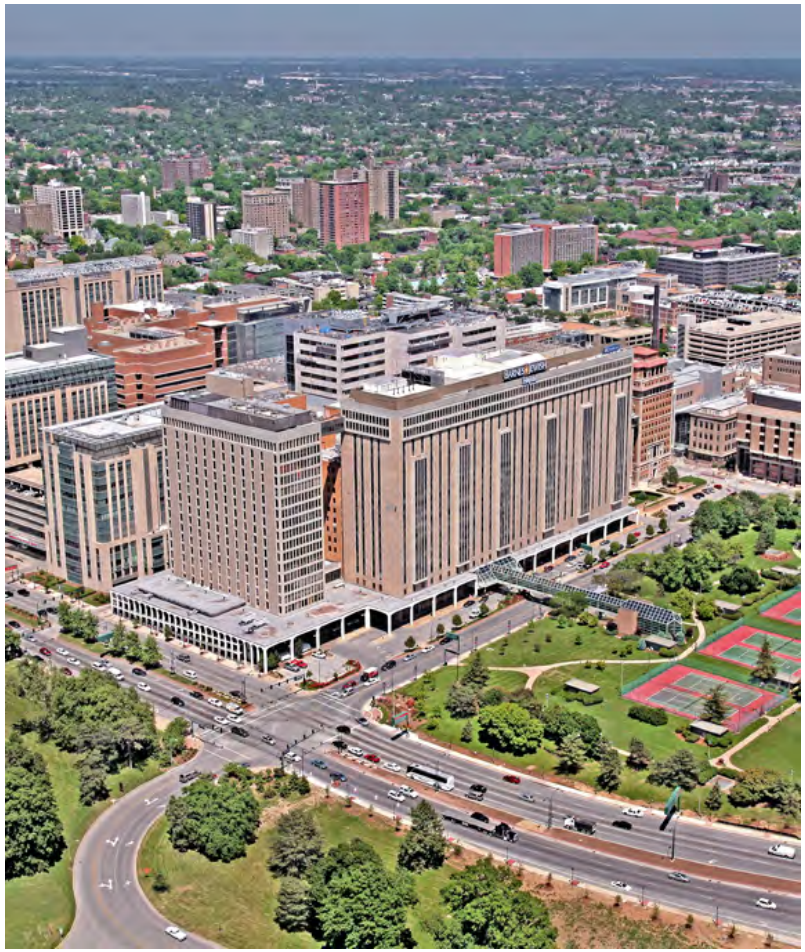
Conclusions

- Creation of a Trauma Surgeon led Geriatric Trauma Service significantly decreased mortality and length of stay at our trauma center.

- Head AIS is also a significant predictor of Mortality and increased LOS.

- In light of the increasing burden of older injured patients, trauma programs must develop robust systems to care for these patients safely and expediently.

Summary – The Elderly Patient



- The elderly patient does better at higher level trauma centers
- Recognize differences in physiology and use that information
- A GTS can improve outcomes

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