RURAL TRAUMA
Challenges & Opportunities

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Objectives

- To define the scope of practice and resource challenges facing rural general surgeons.
- To explore differences in outcomes among patients treated in rural versus urban environments.
- To review means of improving efficiency in order to avoid delays in transportation.
What do rural surgeons do?

Most Common Surgical Procedures in the US
(2014 Healthcare Cost and Utilization Project)

- Appendectomy
- Breast biopsy
- Carotid endarterectomy
- Colostomy surgery
- Cerebral aneurysm surgery
- Cholecystectomy
- Coronary artery bypass or PTCA
- Debridement of wound, burn, or infection
- Dilation and curettage (D&C)
- Skin graft
- Hemorrhoidectomy
- Hysterectomy
- Hysterotomy
- Hemia repair (umbilical, inguinal, incisional)
- Lymph node biopsy or excision
- Mastectomy
- Lymphangiectomy
- Partial colectomy
- Peripheral vascular interventions
- Prostatectomy
- Surgery for low back pain
- Tongue or tonsillectomy or tympanostomy

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Rural Scope of Practice

- Appendectomy, breast biopsy, cholecystectomy, wound debridement, burns, skin grafts, herniorrhaphy, hernia repair, lymph node biopsy, mastectomy, lumpectomy, partial colectomy
- Emergency general surgery, vascular surgery and obstetrics (C-sections)
- Trauma
- Thoracic surgery
- Pediatric surgery
- Endocrine (thyroid, parathyroid)
- Hepatobiliary
- Anorectal
- Diagnostic and therapeutic endoscopy

A rural general surgeon trained in selected obstetric/gynecologic operations could perform 66% of all in-patient procedures in rural hospitals.

With the inclusion of simple vascular cases, head/neck, amputations, and nephrectomies, this could approach 70%.

Where do we do it?
Rural America

- 15% US population (46 million people)
- 72% US land mass

Alaska

- Population 733,720
- 665,384 square miles (2.5x Texas, 425x Rhode Island)
- Population density 1.2 people per square mile
  - Massachusetts, MA: 8
  - Washington: 107.8

- Most recent census data:
  - White: 65.2%
  - Alaska Native (Kuskokwim, Yupik, Ahtna, Eyak, Tlingit, Haida, Tsimshian, Alaskan Native) and Native American: 14.2%

- Home to 17 of the 20 highest mountain peaks in the US
- Long, dark, cold winters (-80F at Prospect Creek in 1971)
Fairbanks Memorial Hospital

- >35,000 ER visits in 2018
- 446 trauma patients
- 172 met criteria for "trauma activation"
- 56 required urgent surgical intervention
- 213 required admission
- 70 required transfer to definitive care (66% neurosurgery)
- 57% male
- 17% pediatric
- 83.5% blunt

Population Challenges

Rural populations are smaller, older, poorer, sicker and less employed.

- Rural America was home to >20% of the US population in 1981.
- 19% of the rural population is over 65 years old compared to 11% urban.
- Between 18 and 64 years of age, the lowest rates of insurance are found in rural counties that DO NOT about a major metropolitan area.
- Federal poverty rate 14.5% in urban areas, 17.7% in rural counties.


Nationwide 11.6%

West Virginia 20%

Washington 9.1%

Alaska 14.6%
Rural populations are also less attended.

- General surgeon to population ratio:
  - 2.7 per 100,000 in 1981
  - 5.7 in 2005
  - 146 urban counties
  - 86 rural counties
- There were more general surgeons in practice in 1981 than 2005 (by 723)
- Among 3,436 federally designated hospital service areas:
  - 18% have no surgeon
  - 30% have <3 surgeons per 100,000 population

*Critical shortage or “surgical desert” per Ricketts and colleagues of the ACS.

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**Alaska Economic Regions**

Northern & Interior population 140,000
5 general surgeons
Ratio 3.5

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Whose outcomes are better?
Should rural residents with colon cancer travel to urban hospitals for colectomy?  

- Dartmouth group used Medicare claims data (1995-99) to compare operative mortality.
- 95% of rural hospitals performed <57 colectomies/year compared to 28% of urban hospitals.
- No statistically significant difference in risk-adjusted mortality overall.
- Low volume rural hospitals showed significantly lower (6.6%, 95% CI 6.3-6.9%) mortality than low volume urban hospitals (7.2%, 95% CI 7.0-7.4%).

Clinical and financial outcomes at urban and rural hospitals among patients receiving inpatient surgical care.

- Johns Hopkins group used National Inpatient Sample (2012-14) to compare clinical outcomes and health care costs for colectomy, appendectomy, and cholecystectomy.
- 1,805,310 patients (89% urban, 11% rural).
- Rural hospitals had lower postoperative mortality (OR 0.940; 95% CI, 0.898-0.983) and shorter length of stay (RR 0.917; 95% CI, 0.905-0.929).
- Postoperative mortality (OR 0.917; 95% CI, 0.880-1.029) and failure to rescue (OR 0.973; 95% CI, 0.851-1.117) were comparable.
- Rural hospital incurred $1,648.96 more cost per patient (95% CI, $1,404.052-$1,893.84; p < 0.001).
- Independent of operation, payer status, and elective vs emergent.

Why not consolidate?
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Emergency General Surgery
- Appendicitis
- Cholecystitis
- Strangulated hernia
- Bowel obstruction
- Perforated ulcer
- Necrotizing fasciitis
- Ischemic limbs
- Trauma
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Trauma

Rural Trauma Burden

- Traumatic injuries are a leading cause of death around the world.
- WHO estimates 5 million traumatic deaths per year, on par with HIV/AIDS, malaria and tuberculosis.
- Rural populations have disproportionately high injury mortality rates after...
  - motor vehicle crashes
  - traumatic occupational injuries
  - drowning
  - unintentional firearm injuries
  - residential fires
  - electrocutions
  - suicides

Increased vehicular speed

- Limited access to surgical care

Outdated road design

- Increased vehicular speed

- Occupational hazards (e.g., agriculture, hunting)

- Secondary prevention

- Seatbelts
- Helmets
- Child safety seats

- Limited emergency medical services

- Increased transport times (distance, weather, decision-making)

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Peek-Asa et al.
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Peek-Asa et al.

Density of surgeons significantly associated with reduced risk of death from motor vehicle crashes in US counties.
- Retrospective analysis of MVC deaths per 1 million inhabitants of each of 3,225 counties from 2001-2005.
- Primary independent variable was density of surgeons per 1 million population.
- Adjusted for density of general practitioners, urbanicity, and socioeconomic status.
- Median MVC deaths per million = 226 (IQR 138-320).
- Median surgeons per million = 55 (IQR 0-105).
- Unadjusted, each additional surgeon per million was associated with 0.38 fewer MVC deaths per million population (p < 0.001).
- Multivariate analysis, 0.16 fewer MVC deaths per million population (p = 0.001).

Geographic distribution of trauma burden, mortality, and services in the United States: Does availability correspond to patient need?
- 2013 state-level data on trauma admissions, trauma centers, surgical critical care providers.
- Compared distribution of trauma admissions with state-level availability.
- 1,346,024 trauma admissions, 2,416 SCC providers, and 1,967 TCs across the country.
- 501 Level I or II trauma centers.
- Considerable variation between top 5 and bottom 5 states (9/11).
- Less variation in trauma admission density (1.5/1).
- Trauma admissions negatively associated with provider density and age-adjusted mortality (p < 0.001).
- Trauma admissions positively associated with per-capita income (p < 0.001).
- Age-adjusted mortality was inversely associated with the number of SCC providers.
- For every additional SCC provider, decrease 618 deaths per year.
Supply & Demand

- Approximately 1,000 surgeons complete residency each year.
- To meet demand, each rural hospital in the US needs to recruit two general surgeons between 2011 and 2030.
- 82.7% would have to choose rural surgery to meet the need.
- Indeed...
  - >70% pursue specialties.
  - 23% would like to practice in a community of 25,000 or less.

Secondary prevention

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Peek-Asa et al.
Factors impacting patient outcomes in urban vs. rural areas.


- EMS
  - before bystander intervention
  - before EMS activation
  - to EMS arrival
  - on scene
  - en route to the closest hospital
  - initial evaluation, determination of stability, labs/imaging, consults, decision to transfer, means of transport (air vs. ground), etc.

Factors impacting patient outcomes in urban vs. rural areas.


A comparison of metropolitan vs. rural major trauma in western Australia.


- 3333 major trauma patients (2005 urban, 1328 rural).
- Mean time to definitive care
  - 39 minutes in urban settings
  - 11.4 hours in rural settings
- Not surprisingly, there was a significantly increased risk of death (OR 2.60, 95% CI 1.05-6.33, p=0.039) in the rural group.
- However, despite higher injury severity scores, rural patients who reached definitive care had an adjusted OR for death of 1.10 (95% CI 0.66-1.84, p=0.508).
In honor of the “Golden Hour”…

- Maximize every opportunity for efficiency.
- Do not delay transfer to definitive care.
- Consider transfer early in the assessment process.
- Quickly determine the needs of the patient and the capabilities of the institution.
- Only order tests that will identify life-threatening injuries that can be treated or stabilized before transfer.

ATLS 10th Edition Student Manual

References

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