

**This issue is devoted to referring hospitals everywhere.** Much of the world population is not within easy reach of a trauma center. Prehospital providers must then make tough decisions regarding where to send their patients. Do they go to the nearest hospital, or do you accept the extra time and expense and send them to a trauma center?

The reality is that about 90% of patients can be treated at their local hospital, regardless of status as a trauma hospital. What about the other 10%? We know that mortality for injured patients who live in rural areas of the US is 50% higher than those in more urban areas. Is it due to care available in their local area, or from the time it takes to get to a higher-level center? How can we figure out which patients really need to go to one?

This issue will cover common issues that non-trauma or lower level trauma centers must deal with when receiving and making decisions regarding transferring these patients. **The next issue will look at the same topics from the receiving hospital perspective.**

## Rural Trauma Team Development Course Impact On Trauma Transfers

The Rural Trauma Team Development Course (RTTDC) is yet another quality program developed by the American College of Surgeons (ACS). It is designed for **all trauma professionals** in rural areas including doctors, nurses, advanced practice providers,

### TRAUMA CALENDAR OF EVENTS

#### SWAN TRAUMA, CC, EMERGENCY SURGERY CONFERENCE

LOCATION: FOUR SEASONS HOTEL, SYDNEY, AUSTRALIA  
JULY 28-29, 2017

#### AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA

LOCATION: MARRIOTT WATERFRONT, BALTIMORE, MARYLAND  
SEPTEMBER 13-16, 2017

prehospital providers, and administrative support. The course is presented over the course of one day and covers a number of topics including:

- Organizing a rural trauma team
- Preparing rural hospitals to manage trauma patients
- Identifying local resources and limitations
- Resuscitation of trauma patients
- Initiating early transfer
- Developing a performance improvement process
- Building relationships between rural hospitals and regional or state trauma systems

The trauma group at Vanderbilt compared a group of six nontrauma hospital in rural Tennessee who had participated in the RTTDC with six other rural hospitals matched for size, volume, and distance from the Level I center.

Here are the factoids:

- A total of 130 RTTDC patients were compared with 123 from hospitals that had not participated
- Overall demographics and number of imaging studies were the same
- **The call to transfer occurred 41 minutes sooner in the RTTDC hospitals**
- **Length of stay in the referring ED was 61 minutes shorter** in the RTTDC hospitals
- Number of images obtained pre-transfer and mortality were unchanged

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**Sample Transfer Checklist** <http://bit.ly/trauma-xfer>

**Bottom line: The numbers were small and the review was retrospective, but the results are nonetheless impressive. Granted, there was no decrease in mortality, but this is a relatively crude indicator, especially when small numbers are involved. But time to phone call and time spent in the referring ED were significantly shorter. Does anyone think that longer times to transfer are somehow good for patients?**

**Rural hospitals should consider attending RTTDC in order to improve the care of patients from their communities.**

*Reference: Rural trauma team development course decreases time to transfer for trauma patients. J Trauma 81(4):632-637, 2016.*

## Impact Of Imaging Prior To Transfer

The reality is that 90% of injuries are minor and can be treated at any hospital. A minority of patients actually have issues that require transfer to a higher-level trauma center. Physical examination can certainly help determine who some of those patients are. Think obvious open fracture or severe brain injury at a hospital without key specialists to care for them.

But not all injuries are that obvious. Imaging techniques are the next step to identifying injuries that would require transfer. The question is, **how much imaging is appropriate?**

A few hospitals are selective about it. But many proceed with a comprehensive battery of scans and x-rays. Some believe that their receiving trauma center expects it. And a few may be doing it for the money, unfortunately. So who is right?

There are three issues at play: **time, accuracy, and radiation exposure.** Let's pick them apart.

**Time.** It takes time to get radiographic studies. Depending on the number obtained, it can take up to 90 minutes. A study looking at transfers from rural hospitals to a regional trauma center in Wisconsin found that the **median time to transfer significantly increased from 67 to 140 minutes with the addition of even a single CT scan.**

This issue appears to be even more of a problem in children. A group at Cincinnati Children's Hospital

studied the characteristics of children who experienced prolonged transfer times to a Level I pediatric trauma center. They reviewed 5 years of registry data, looking at time of injury to time of arrival at their center. The State of Ohio has a goal of a maximum 2-hour transfer time.

And here are the factoids:

- 748 patients were included in the study, and the demographics were predictable (65% male, 97% blunt)
- 25% were more severely injured (ISS > 15)
- **The majority of the patients (82%) arrived well after the 2-hour goal (7 hrs!!)**
- 79% of patients with high ISS and 47% of those with severe TBI arrived late (!!)
- Transfer tardiness did not correlate with distance, and **was only slightly improved when a helicopter was used**
- **Significantly more CT scans were obtained in the late transfer group (49% vs 23%),** and appeared to have no correlation with GCS or vital signs. **There was, however, a significant correlation with private insurance.**
- **Half of the children with scans arrived without results or had suboptimal imaging,** resulting in repeat scans in about one third.

**Accuracy and radiation exposure.** These two factors are inextricably linked because inaccuracy begets additional imaging. As noted in the previous study, radiology results are frequently lacking, or the studies are not done well, as determined by the receiving center. This means that accurate results, or no results at all, are available after transfer. How much of a problem is this?

The Level I center at UC Davis looked at all incoming trauma transfers that had any CT imaging done prior. Of 370 patients, **one quarter needed repeat scans.** Most common were head scans (47%) and cervical spine (20%). **The most common reasons for repetition were referring hospital scan not available (42%) (not sent, couldn't open) and insufficient quality (20%).** This resulted in significant additional radiation exposure, with 4% of patients receiving more than 10mSv!

**Bottom line: Imaging prior to transfer definitely increases time to transfer and frequently results in repeat imaging and more radiation exposure. So why does it happen? Sometimes, it's the mistaken belief that it will save time after transfer. Not the case. Or there is time left before the transport ambu-**

lance or helicopter arrives, so why not use it? Not a good reason, and it may delay the transfer team if they arrive early. Or the receiving trauma center “expects it.” Not if they’ve looked at any of these papers!

The best approach is to order only images that will guide *your* therapy. A chest x-ray on arrival or after intubation. A pelvic x-ray to determine if a binder should be applied. A CT of the abdomen to see if there are any injuries that can’t be taken care of at your hospital. As a general rule, once you have found an injury your hospital can’t treat, or have made the decision to transfer for any other reason, no additional imaging is indicated! And to make sure that the receiving center has access to any imaging you did get, keep reading below.

*References:*

*Consequences of increased use of computed tomography imaging for trauma patients in rural referring hospitals prior to transfer to a regional trauma centre. Injury 45:835-839, 2014.*

*Unnecessary imaging, not hospital distance, or transportation mode impacts delays in the transfer of injured children. Pediatric Emerg Care 26(7):481-486, 2010.*

*Rate and Reasons for Repeat CT Scanning in Transferred Trauma Patients. Am Surg 83(5):465-569, 2017.*

## Radiographic Image Sharing Systems

There are generally three ways to share radiographic images with your upstream trauma center:

- **Hard copy.** These days, that usually means a CD. Nearly all PACS systems (picture archiving and communications systems) can write CDs that can accompany your patient. **Advantage:** super cheap. **Possible downsides:** the CD may be corrupted and not openable, the software on the disk cannot be installed or will not run at the receiving hospital, and finally it can just be forgotten in the rush to get the patient out of the ED.
- **PACS system connections.** These are software links that enable one hospital’s PACS software to communicate with another’s. They must be established in advance, and generally require some expertise from the hospitals’ IT departments. Images can be pushed from one

system to another. **Advantages:** once set up, it is very inexpensive to maintain, and images can be viewed prior to patient arrival at the receiving hospital. **Possible downside:** Although the interchange format is standardized, every once in a while the systems just can’t communicate.

- **Web-based image sharing system.** This consists of a web server-based software application available via the internet that allows subscribing hospitals to sign on and share images. Referring hospitals can upload images from their PACS systems for free, and the receiving hospital can view the images and/or download into their own system. **Advantage:** these products are simple to set up, and easy to use after just a little training. Compatibility is very high, and the services are continually working to ensure it. **Downside:** expensive. Depending on specifics, the annual subscription may be up to \$100K per year, and is generally footed by the receiving trauma center.

Is a web-based solution worth it? MetroHealth in Cleveland looked at this over five years ago, and published their results in 2015. They looked at their experience pre- and post-implementation and found the following:

- Three years of transfer data prior to the web system implementation was compared to one year of experience after
- **CT imaging decreased** at both referring and receiving hospitals across the study period
- **Repeat scan rate decreased** from 38% to 28%. Repeat head scans were the major driver at 21%.
- Cost of reimaging dropped from about \$1000 per patient to \$600

**Bottom line: As a referring hospital, it is your responsibility to ensure that the (hopefully) few images you obtain make it to the upstream trauma center. Although hard copy (CD) is the cheapest, it is also the least reliable. Work with your radiology and IT departments to determine which electronic solution is best for you. Some states and regional trauma systems help subsidize or provide a web-based solution for their member hospitals.**

Reference: *Implementation of an image sharing system significantly reduced repeat computed tomographic imaging in a regional trauma system. J Trauma 80(1):51-56, 2016.*

## Secondary Overtriage: What Is It, And Why Is It Bad?

**Simply put, secondary overtriage (SO) is the unnecessary transfer of a patient to another hospital.** How can you, as the referring trauma professional, know that it is unnecessary? Almost by definition, you can't, unless you have some kind of precognition. If you knew it wasn't necessary, you wouldn't do it in the first place, right?

But using the retrospectroscope, it's much easier. The classic definition describes a patient who is discharged from the hospital shortly after arrival there. What is "shortly?" Typically, it occurs **within 48 hours** in a patient with **low injury severity** (ISS < 16) and **without operative intervention**. Definitions may vary slightly.

And why is it bad?

Several states with rural trauma systems have scrutinized this issue. The first study is from West Virginia, where six years of state registry data were analyzed. Over 19,000 adults were discharged home from a non-Level I center within 48 hours after an injury. Of those, about 1,900 (10%) had been transferred to a "higher level of care" and discharged from that center (secondary overtriage, could be any higher-level trauma center).

The factoids:

- Patients with ISS > 15 and requiring blood transfusion were more likely to be SO. (*I would argue that this is appropriate triage in most cases!*)
- Neurosurgical, spine and facial injuries were also associated with SO. (*This one is a little more interesting, see below*).
- SO was more likely for transfers during the night shift, when resources are often more scarce

The problem is that this study is descriptive only. It doesn't really help us figure out which patients could/should be kept based on any of the variables they collected.

The next study is from Dartmouth in New Hampshire and examines transfers into that single Level I center from 72 other hospitals. Registry data were examined over 5 years, identifying transfer patients with ISS < 15 who were discharged within 48 hours without an operation.

Yet more factoids:

- 62% of the nearly 8,000 patients received by this center were transfers
- **Overall SO rate was 26%**
- A quarter of adult patients and one half of pediatric patients were considered SO, and about **15% of them were actually discharged from the ED (!)**
- Head and neck, and soft tissue injuries were most common among SO patients

**The real bottom line: Each of the sections of this newsletter are basically looking at the very real problem of secondary overtriage. Here are my thoughts on what you can do to try to decrease the number of *your* patients with SO and optimize the transfer process:**

- **Work with your upstream trauma center to determine how much imaging you *really* need to perform**
- **Develop a reliable method of getting those images to them**
- **Ask them to help you develop practice guidelines and educate your hospital/ED staff to help manage common diagnoses that often result in SO from your center**
- **If you are located in a rural area, inquire about RTTD courses you might attend**

References:

*Secondary overtriage in a statewide rural trauma system. J Surg Research 198:462-467, 2015.*

*Secondary overtriage: the burden of unnecessary interfacility transfers in a rural trauma system. JAMA Surg 48(8):763-768, 2013.*

**Check out the sample transfer checklist on the next page. Download a Word document version to customize at <http://bit.ly/trauma-xfer>**



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## **YOUR HOSPITAL NAME TRANSFER CHECKLIST**

Patient name:	
Diagnosis list:	
Transferring Physician:	
Contact number:	
Accepting Physician:	
Family member name:	
Contact number	

Transfer Level Of Care	Method of Transfer
<input type="checkbox"/> ALS <input type="checkbox"/> BLS <input type="checkbox"/> Critical Care	<input type="checkbox"/> Ground <input type="checkbox"/> Air Called at: _____

<p><b>Send with patient:</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/> Face sheet with demographic information</li><li><input type="checkbox"/> Advance directive information</li><li><input type="checkbox"/> Transfer consent with COBRA form</li><li><input type="checkbox"/> Initial EMS run sheet</li><li><input type="checkbox"/> Copy of ED record</li><li><input type="checkbox"/> Lab and radiology reports</li><li><input type="checkbox"/> Medication record</li><li><input type="checkbox"/> EKG</li><li><input type="checkbox"/> Imaging (check all that apply)<ul style="list-style-type: none"><li><input type="checkbox"/> CD</li><li><input type="checkbox"/> VPN</li><li><input type="checkbox"/> Web-based transfer</li></ul></li></ul> <p><b>Give to family:</b></p> <ul style="list-style-type: none"><li><input type="checkbox"/> Directions and contact number for receiving facility</li><li><input type="checkbox"/> Patient belongings</li></ul>
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<p><b>Notes:</b></p>   
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