Surgical Teams:
How to implement, develop and get support

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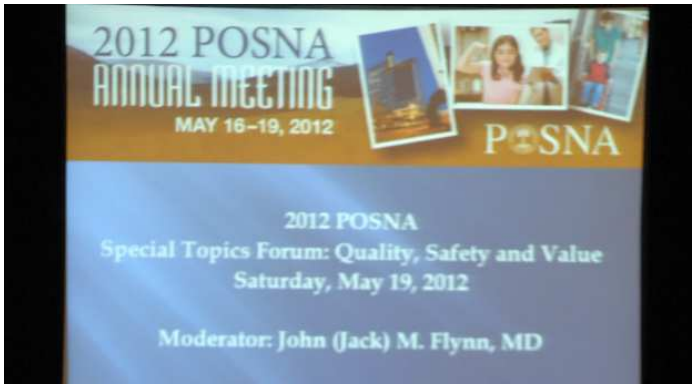
Disclosures up to date in program

The idea; the motivation

POSNA 2012 QSV Special Session

- Peter Laussen CICU Boston
- Marshall Carlson, President Hendricks Motorsports (NASCAR)
- Tom Henricks, NASA Shuttle Commander
- Dan Hyman Chief Quality Officer, Denver



The idea; the motivation

Wow. That's amazing. I wonder what it would be like to have a spine OR team that was like a NASA or NASCAR team

The idea; the motivation

An OR team like a NASCAR team

- Everyone knows their role
- Everyone has done their job 1000s of times
- Each coordinates perfectly with other crew members
- Each person take pride in the success of The Team

The idea; the motivation

- Dedicated Teams in other CHOP OR units (separate Cardiac, Fetal units)
- We made the case for Spine
  - Failed in past
  - Maybe now is the time
    - Need to use OR time better
    - Focus on the value aspect

The Challenges

The challenges

- Big training center with rotating personnel
- Staffing shortages, turnover
- Administration who like the “job description with legs” philosophy
- Anesthesia: “we are general anesthesia”

The challenges

Administrators Hate Dedicated Teams

- Employees gain specialized skills (and lose some general skills)
- Employees gain (too much) loyalty to the Team
- Some Teams might be more fun, or easier, or finish earlier
- Managers lose flexibility for cross-coverage (maternity leave, illness, departures)

Administrators like nurses and anesthesiologists who are interchangeable jacks-of-all-trades

The challenges

Anesthesia Hates Dedicated Teams

- "We are Pediatric Anesthesiologists--that is already specialized"
- "We have to cover MRI, satellites, take call, etc"
- "Board runner needs flexibility"
- "We need to be able to plug in our Fellows and CRNA's wherever the heck we want"
- "Teams are more fun for our docs, but it's not fair to those who are not chosen"

Administrators like nurses and anesthesiologists who are interchangeable jacks-of-all-trades

The challenges

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- Concurrent surgery
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  - We weren't allowed
- Our need
  - 2 PSFs, back-to-back, in 1 OR room
  - Sustainable practices

A trial with friends, then engaging Pro's

A trial with friends, and lessons learned

- Some friends and I were excited to do "secret trial"
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A trial with friends, and lessons learned

- Some friends and I were excited to do “secret trial”
- Summer 2014—tried a few 2x PSF/day
- Needed lots of special, unsustainable strategies
- The amateur attempt worked but unsustainable; but we needed pro’s

Engaging some pro's

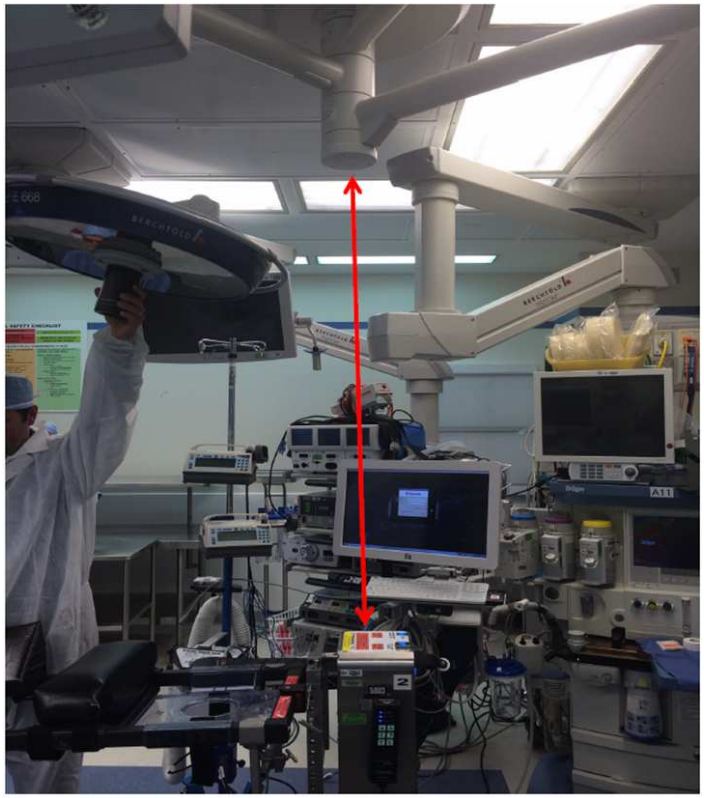
- CHOP Office of Clinical Quality Improvement (OCQI)
- OCQI funded "improvement advisor" to launch us
- Observations
- Group meetings

Standardization and Training

Standardization and Training

- Created a Dedicated Spine Team
- Standardized work
- Late afternoon training meetings; walk-throughs

AIS Spinal Fusion: 2/day General Logistics



Control box of Jackson table directly under the articulating elbow

Standardization and Training

Spring of 2015

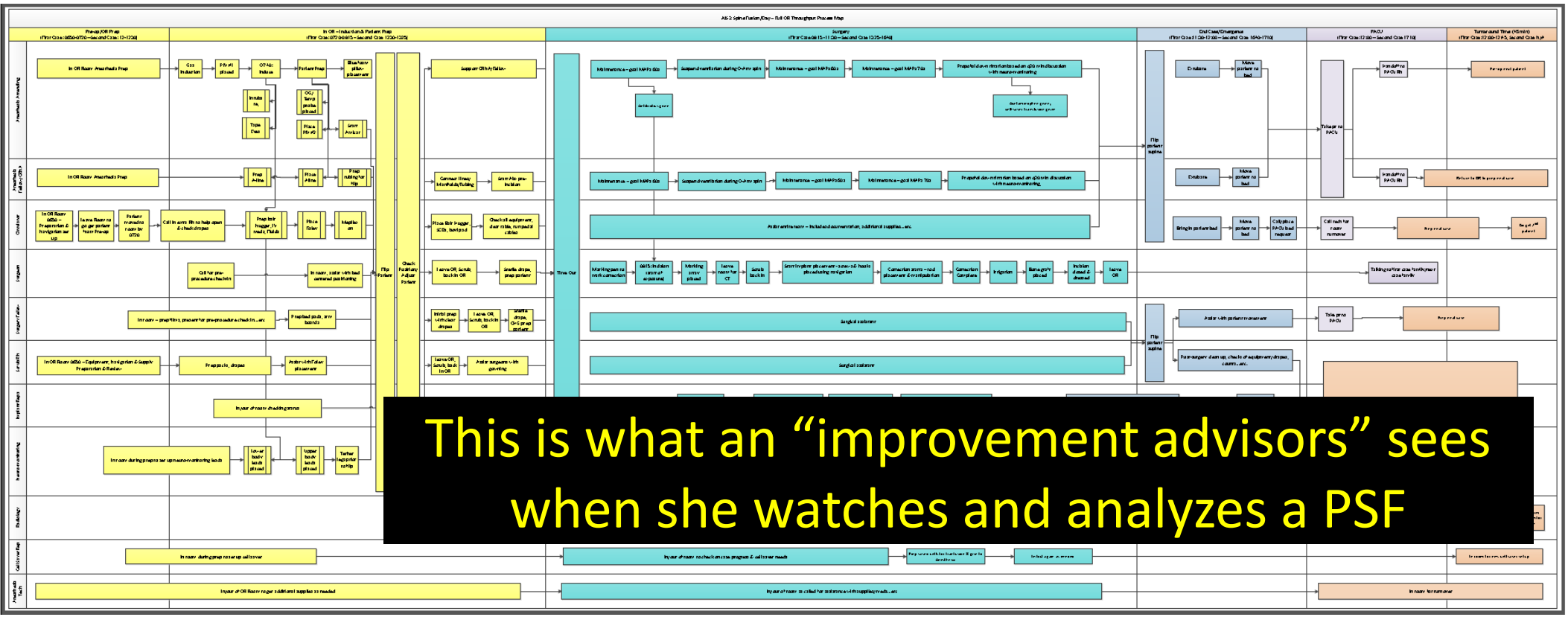
- Standardized spine anesthesia
- Simulations to eliminate inefficiencies
- Standardized process:
  - Positioning
  - Prep & draping
  - Imaging
  - Patient wake-up
  - Transport

AIS Spinal Fusion Intraoperative Protocol

Preoperative & Intraoperative Management	
Medication Management	**Pre-Op (1-2 weeks before surgery)** - Gabapentin and acetaminophen ordered by orthopedic nurse practitioner o less than 40kg gabapentin 15mg/kg and acetaminophen 12mg/kg (oral) o 40 - 59kg gabapentin 600mg and acetaminophen 650mg (oral) o 60kg or greater gabapentin 900mg and acetaminophen 1000mg (oral) **Pre-op (morning of surgery)** - Gabapentin and acetaminophen taken with a sip of water prior to leaving for the hospital - Consider placement of preoperative PIV if patient is appropriate (before or after midazolam premedication) - OR nurse to call pre-op nurse and perform telephone handoff - Anesthesia team to bring patient back to the OR following handoff event to allow OR nursing to prepare for case (see epic screen below) **Intraoperative** - Induction (see image below for positioning of anesthesia carts to maximize workspace) - General endotracheal anesthesia with standard induction and 2 PIV's (at least one should be 18 gauge) and transition to TIVA (see below) - Avoid paralytic if possible due to neuromonitoring - Encourage parallel processing and team communication to allow for multiple tasks to be completed in concert o Anesthesia to place radial arterial line (consider use of arm board devise to slip under mattress) o Neuromonitoring will sequentially place leads (lower extremity, head once ETT secured, and upper extremity once vascular access secured) o Circulating nurse/ortho fellow to place foley (OK to perform while arterial line being placed but COMMUNICATE) - Methadone 0.1-0.2 mg/kg (max 10mg) - Cefazolin 30mg/kg up to 2 grams or clindamycin 10mg/kg up to 900mg for PCN allergic patients - Dexmethasone 0.1mg/kg up to 4mg for PONV (some advocate for 0.2mg/kg up to 8mg for potential analgesic benefit) - Attending surgeon and fellow present for patient flip on to Jackson table (seem image below for ideal bed position) - Maintenance - TIVA with propofol with opioid infusion or boluses (remifentanil, fentanyl, sufentanil) - Following exposure, work with neuromonitoring to reduce propofol rate based on patients depth - Blood loss can be significant 500 – 1000 cc's but we routinely use cell saver so most patients are spared an intraoperative transfusion - Many of these patients have autologous blood but patients are rarely transfused intraoperatively - Antifibrionolytic therapy - Aminocaproic acid 100mg/kg load with infusion (<25 kg - 40mg/kg/hr, 25 to 50 kg - 35mg/kg/hr, >50kg - 30mg/kg/hr) - Exposure - maintain MAP's in 60's mmHg and consider using nicardipine 0.5 – 1 mcg/kg/min and titrate to effect - Correction – maintain MAP's in 70's to 80's mmHg, discontinue nicardipine, consider ephedrine/phenylephrine bolus +/- fluid bolus to treat lower blood pressure, dopamine/phenylephrine infusion occasionally needed - Fluid maintenance with crystalloid and blood (monitor Hgb with Hemocue/ISTat during the case) - Emergence - Acetaminophen IV x 1 at skin closure o less than 12y/o and/or less than 40kg acetaminophen 12.5mg/kg (IV) o 12y/o or older and greater than 40kg acetaminophen 15mg/kg up to 1000mg (IV) - Ondansetron 0.1mg/kg up to 4 mg - Extubate when clinically appropriate o For sedated by spontaneously breathing patients postoperative neurological exam may be deferred until awakening in the PACU if signals were stable throughout the procedure – discuss with the surgeon of record o Titrate morphine or hydromorphone as needed for patient discomfort - Medications should be ordered by the Anesthesia team the night before surgery - Medication dosage and time of administration should be reported to the Acute Pain Management Service (APMS) while patient is in the operating room

Developing Dedicated Spine Teams: Lessons Learned

Standardization and Training



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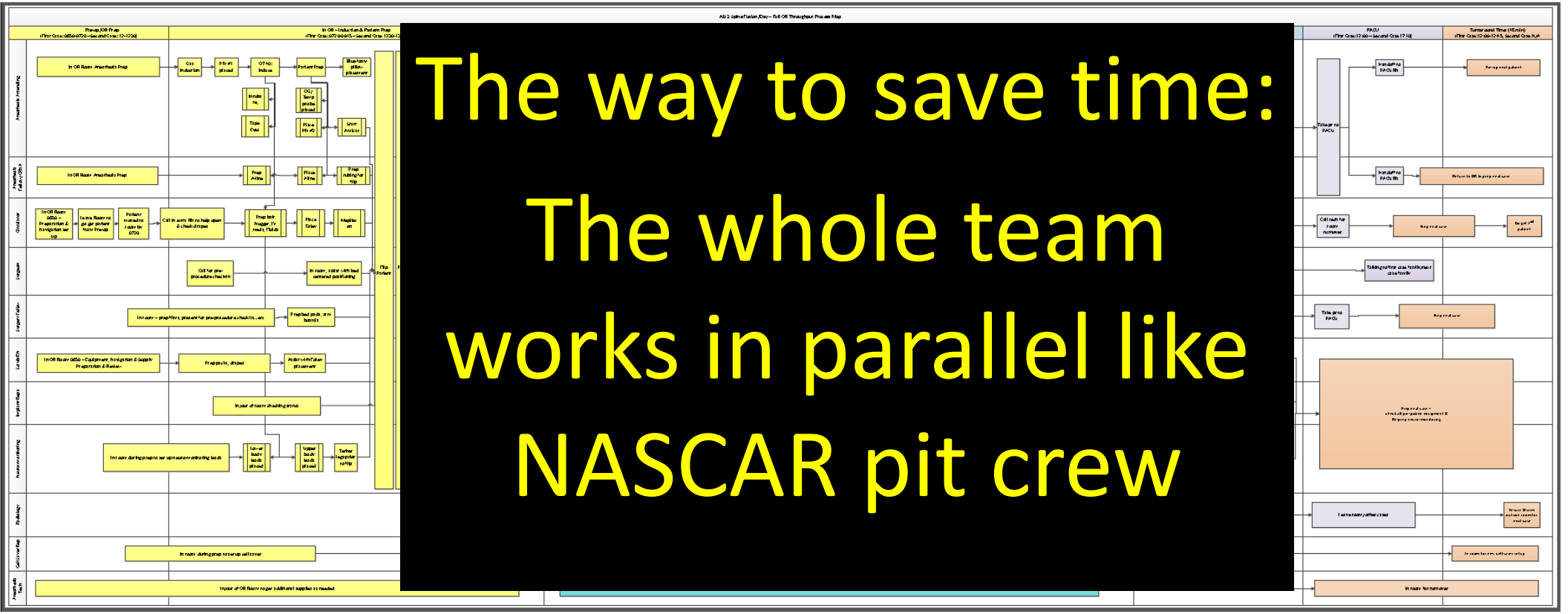
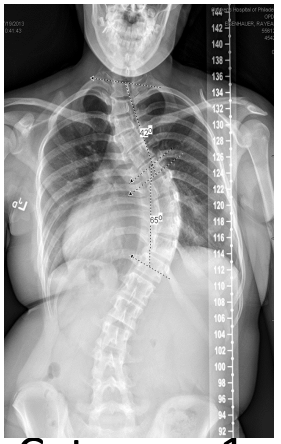


Standardization and Training

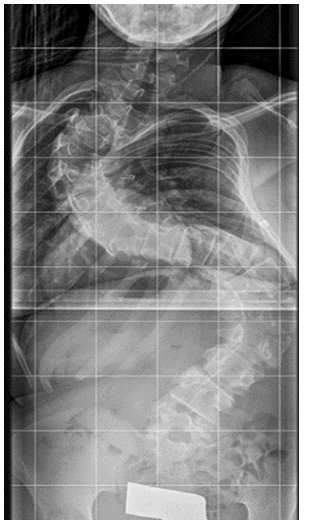
Case Description

- What is "Spine deformity PSF"?
  - T4-12 50°—2.5hr. Easy to standardize
  - T2-pelvis with VCR in obese patient who had heart transplant—all day
- Need a system to communicate "what we are doing tomorrow"
- Really, only the surgeon knows

	Standard Fusion	Complex Fusion	Complex Patient and Complex Fusion	Other Spine Operations
Category	I	II	III	IV
Surgical case description	PSF ≤ 12 no osteotomies *and* BMI < 25 *and* No medical issues that impact case length	PSF >12 *and/or* osteotomies *and/or* BMI >25 *and* No medical issues that impact case length	• CP, SMA or other NM fusions to L5 or pelvis • Freidrich's Ataxia • Cardiac patients	• MAGEC, VEPTR or GR insertions, revisions, expansions, or graduation fusions • C-spine • Hemivert. excisions • Tethering • Spondy fusions • Tumors • HNP excision
Anesthesia considerations	• Standard set-up (ET tube placement, 2 IVs, arterial line) • No central line needed • Anesthesia ready time usually 7:45-8a	• Standard set-up (ET tube placement, 2 IVs, arterial line) • No central line needed • Anesthesia ready time usually 7:45-8a	• Airway, lines…etc. complex. • Central line often needed • Possible transesophageal echo • Possible wake-up test • Possible skeletal traction • Anesthesia ready time may vary from 8:00-10:00a	Variable
OR Considerations	Standard	Standard	Variation: Implants, monitoring, set up and personnel	Variable



Category 1

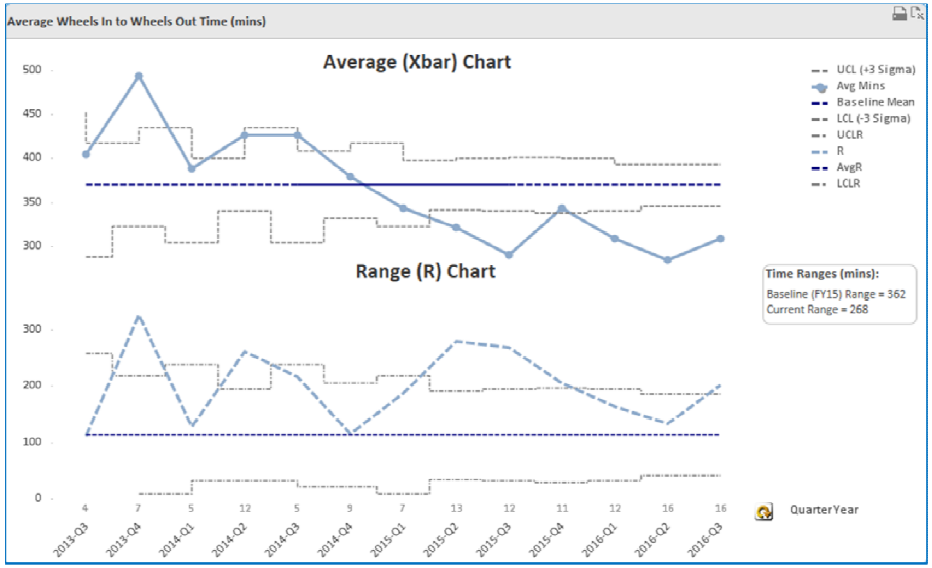


Category 2

Official launch, then scaling it up

Official launch

- 1 surgeon, small group of anesthesia/nursing
- Data collection
- Regular meeting to review data, solve problems



Scaling it up

Phase 1 vs. Phase 2

- Phase 1
  - Single surgeon
  - 4 anesthesiologists (standardized protocol)
  - Small group: RNs, CRNAs, techs
- Phase 2: scaling up
  - 2 surgeons (later, a 3rd)
  - 12 anesthesiologists (standardized protocol)
  - Expanded group: RNs, CRNAs, techs

Results (the data)

Results

- Category 1 cases: more efficient by 111.4 mins (29.7%)
- Category 2 cases: more efficient by 76.9 mins (18.5%)
- Average decrease in OR time was 22.0 (+/-4) mins/per level fused for Category 1 cases

Dedicated Teams saved

1-2 hours per PSF

Results

Financial analysis

- Cost/min OR time
- Category 1 cases: cost reduction >$8900 ($p<0.001$)
- Category 2 cases: cost reduction >$6000 ($p<0.001$)

Dedicated Teams saved $6000-$9000 per PSF

Results

Phase 1

- Cat. 1 cases more efficient by 104.8 mins ($p<0.001$)
- Cat. 2 cases by 75.8 mins ($p<0.001$)

Phase 2 (project scaled)

- efficiency persisted
- all 4 time epochs sig. shorter for Dedicated Teams $p<0.01$

The scaling worked

Results

Multivariable linear regression

- BMI, number of level fused
- number of osteotomies, surgeon
- type of team (Dedicated or Casual)

- Utilizing a Dedicated Team 91.5 minutes ($p < 0.001$)
- Increasing BMI: 3 more min
- Osteotomies: 15mins

The biggest impact on OR mins:

A Dedicated Team

Results

Safety

- Impossible to prove "safer"
- 0/78 adverse events for Dedicated Team
- 4/89 adverse events for Casual Team
  - –2 NM changes, full return
  - –UPROR: 1 superficial SSI
  - –UPROR: 1 dislodged screw cap

Dedicated Team:

No adverse events

Developing Dedicated Spine Teams: Lessons Learned

Sustaining

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- Harder than initiating

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- New team members (trainees, MDs, RNs) need to be carefully oriented

New arrivals at a huge teaching hospital (and not just July 1)

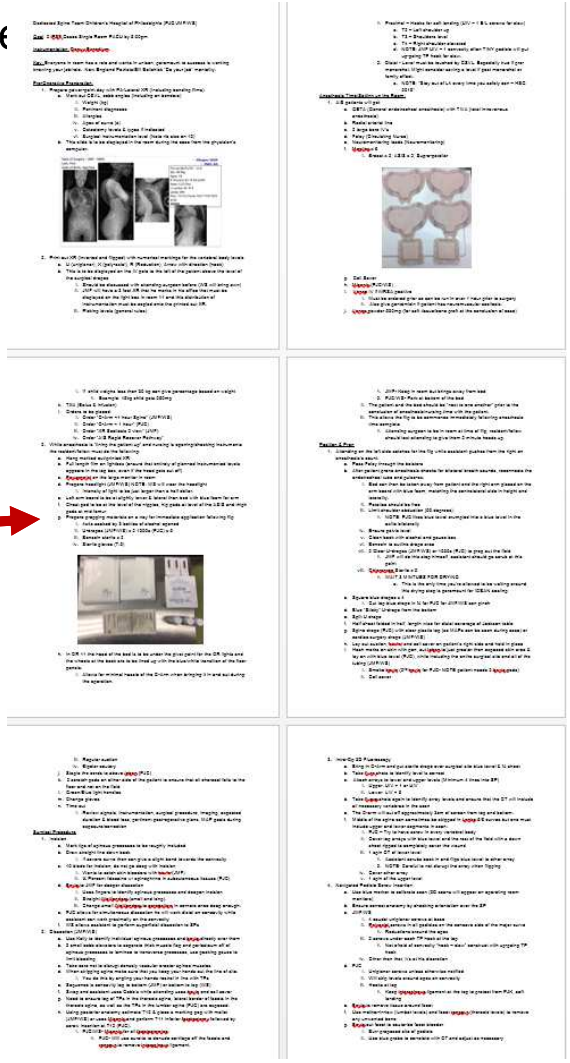
Sustaining

- Harder than initiating
- New team members (trainees, MDs, RNs) need to be carefully oriented
- Memory is limited for OR management—reminders/updates

Sustaining

You need enduring materials

- Surgical protocol shared with incoming trainees
- Spine anesthesia protocol on hospital intranet



DST Surgical protocol for Trainees

Sustaining

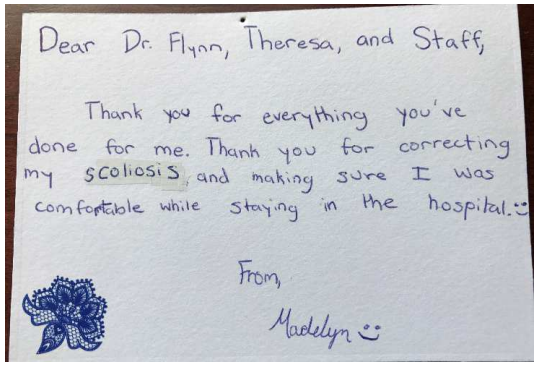
Culture, culture, culture

- Team-building never ends
- Share the results
- Constantly remind the team
  - –Their work is special
  - –The results are great

Sustaining

Culture, culture, culture

- Connect what happened in OR to happy patients post-op (stories)
- Happy hours for team-building



7 lessons learned (to date)

Summary of lessons learned (to date)

1. Use the wisdom from other Team Sports (NASA, NASCAR, etc) to create your vision

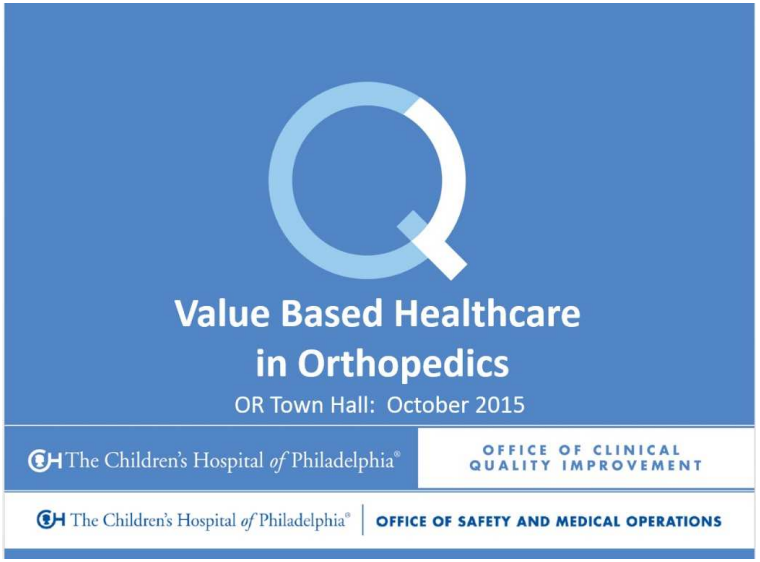
Summary of lessons learned (to date)

2. Find a compelling reason

- You probably can't prove it's "safer"
- They won't care it's about professional satisfaction for OR staff
- So make it about money and time saved (value)

Summary of lessons learned (to date)

3. Find a way to spread the results (OR Town Halls, QSV displays at hospital, etc)



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4. Easy in a sandbox, hard on a beach

- Sandbox
  - Small, private entrepreneurial setting
  - Nimble decision-making and change agency
  - Shared expertise

Summary of lessons learned (to date)

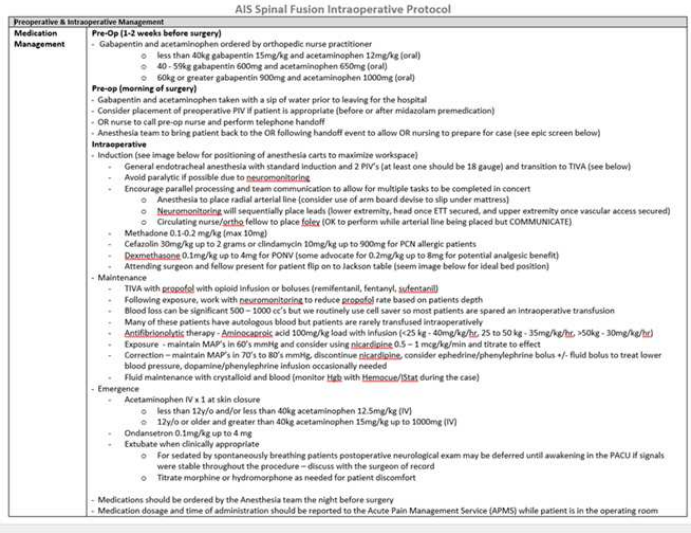
4. Easy in a sandbox, hard on a beach

- Sandbox
  - Small, private entrepreneurial setting
  - Nimble decision-making and change agency
  - Shared expertise
- Beach
  - Sprawling academic medical center
  - Many competing interests
  - Dilute leadership with limited understanding

Summary of lessons learned (to date)

4. Easy in a sandbox, hard on a beach

- You should involve experts (improvement advisors) if available
- You must standardize (but MDs will resist because “their way is best”)
- You must have enduring materials



AIS Spinal Fusion Intraoperative Protocol

Preoperative & Intraoperative Management

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Summary of lessons learned (to date)

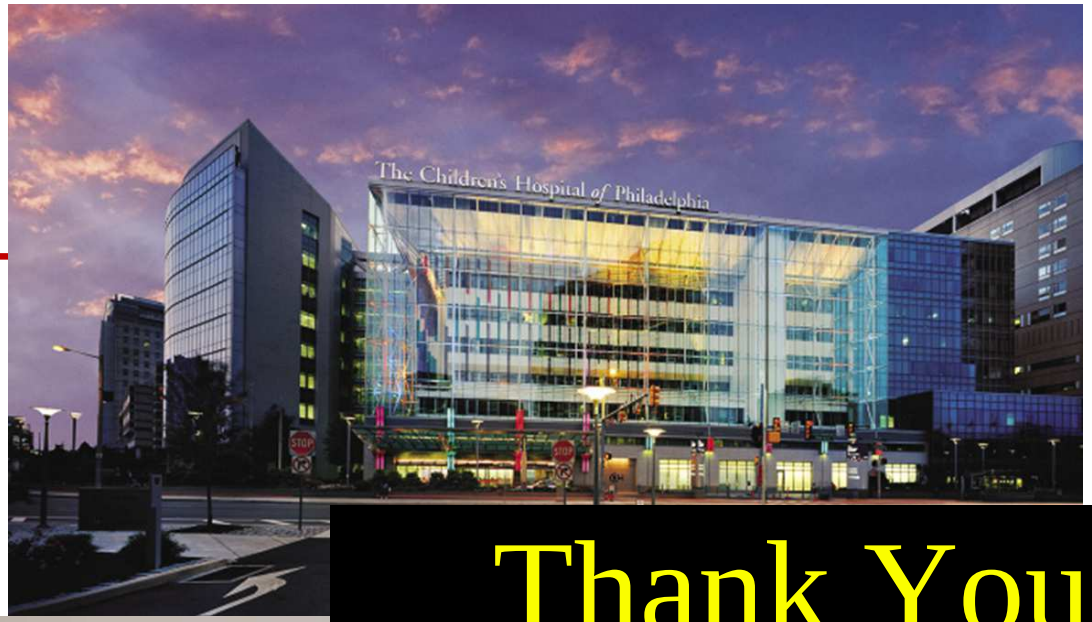
5. You must update regularly as conditions, techniques and personnel change

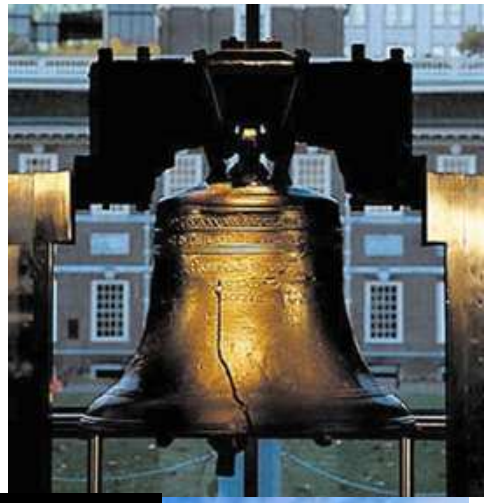
Summary of lessons learned (to date)

6. Memory is limited for OR management—reminders/updates

Summary of lessons learned (to date)

7. Culture, culture, culture: team-building never ends





Thank You