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Process Optimization for Improved Delivery of Surgical Instruments

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CENTER FOR
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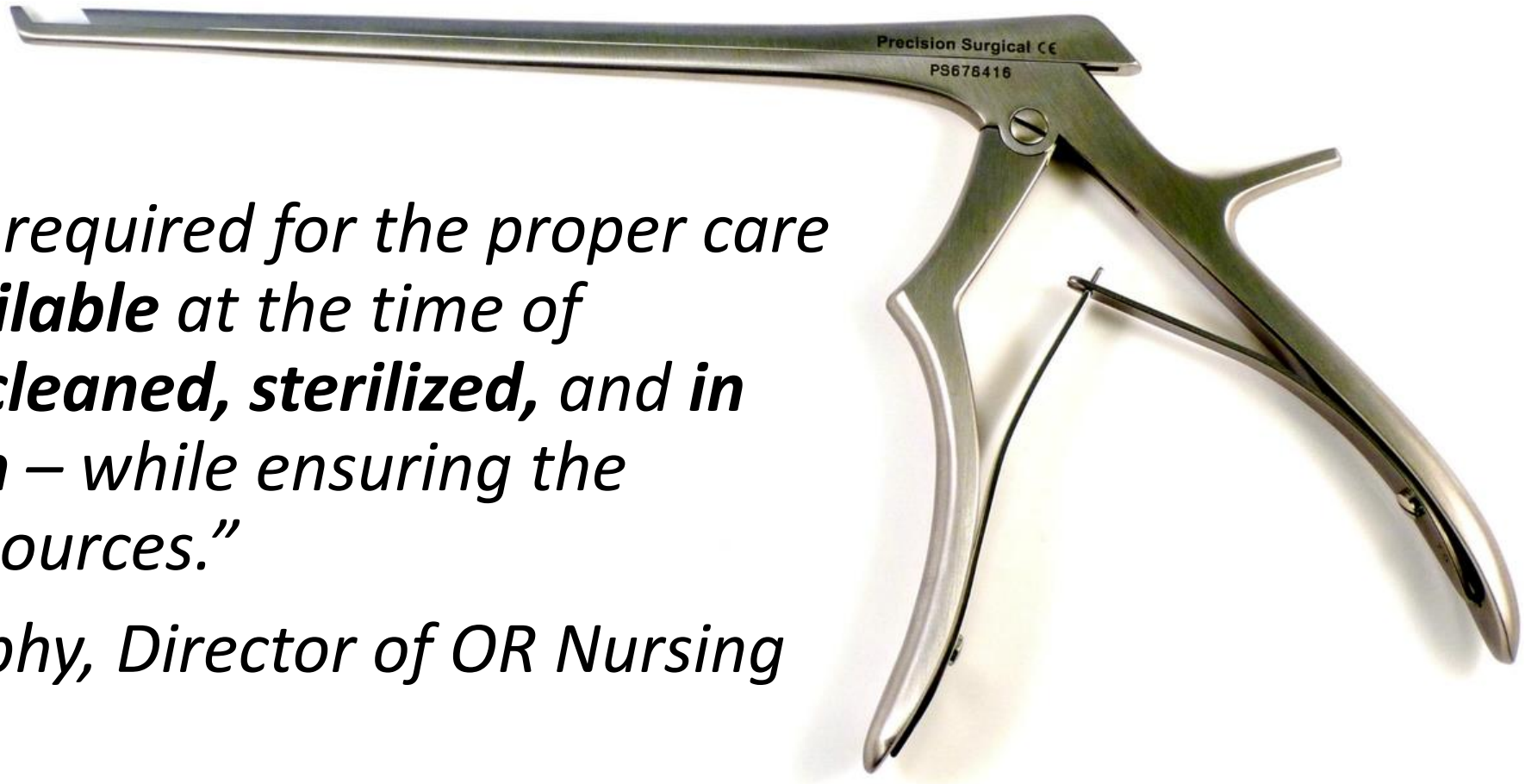
Outline

- **Motivation & Background**
- **Current Issues**
- **Solutions**
  - Cleanability Index
  - Cleaning Time Estimation
- **Future Work**
- **Questions**

MOTIVATION & BACKGROUND

- Goals
- Key Terms
- Surgical Instrument Cycle & Reprocessing

Goals



"To have all items required for the proper care of the patient ***available*** *at the time of surgery, properly* ***cleaned, sterilized,*** *and* ***in working condition*** *– while ensuring the efficient use of resources."*

--Shawn Murphy, Director of OR Nursing

Key Terms

- **Bioburden** — Contamination by tissue from a previous surgical case (e.g. blood, bone)
- **CSPD** — Central Sterile Processing Department
- **OR** — Operating Room
- **Surgical Case** — Surgery

Surgical Instrument Cycle

1) Purchased → 2) Catalogued → 3) Grouped into sets → 4) Stored in CSPD → 5) Used & Cleaned in ORs → 6) Decontaminated in CSPD → 7) Assembled in CSPD → 8) Sterilized in CSPD

Tympanoplasty Instrument Set

Surgical Instrument Reprocessing

- Industry-wide efficiency challenge

- Complicated & resource-intensive process
- Current state at UMHS:

28 ORs

51,000+ cases per year → 65-70 cases per day

4,000 instruments processed per day

CURRENT ISSUES

- Contributing Factors
- Challenges

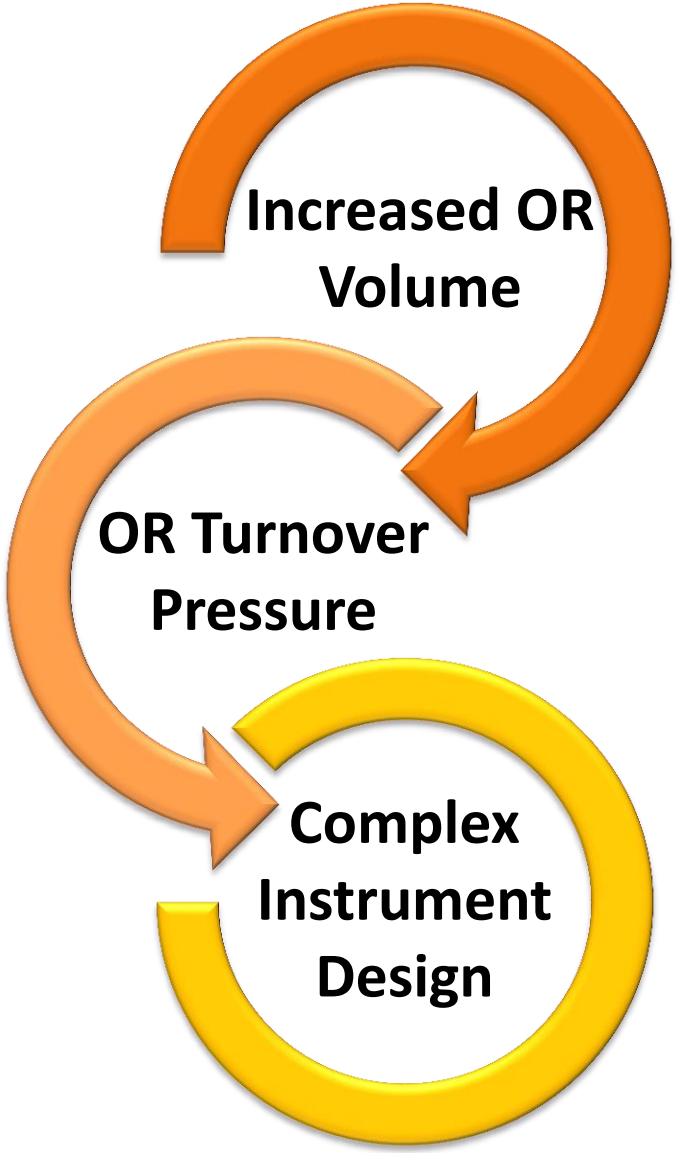
Contributing Factors

These issues lead to Surgery delays, potential hazards to patients, and excess workload for staff.

Key Issues

- Institutional outcome measures not being met:

Current Challenges



- CSPD struggles to keep up with the demand
- OR staff forgo point-of-use instrument-cleaning protocol
- Each instrument has a unique cleaning protocol (IFU)

SOLUTIONS

- Cleanability Index
- Cleaning Time Estimation

Cleanability Index

Objectives

Systematically determine:

- An instrument's level of cleanability (e.g. 1-10 scale)
- A set's level of cleanability based on its instruments
- Appropriate cleaning effort of each set

Feature: Blade

Feature: Hinges

Goal

Develop an instrument "Cleanability Index" (CI) for all Neurosurgery instruments

Methods

- Focus group surveys
- Instrument feature ranking games
- Analytical Hierarchy Process

Cleanability Index

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Findings and Conclusions

- With this information, we identified Neurosurgery's low-risk and high-risk instruments (1.3%) and their associated design features
- Preliminary analysis showed positive correlations between
  - Staff perceptions and trending bioburden incident data
  - Staff perceptions and hard-to-clean instruments identified by the CI system
- Results could be used to guide additional cleaning efforts

Surgical Bowl
EASIER to clean

Retractor
HARDER to clean

Cleaning Time Estimation

Objectives

Quantify time needed for:

- Bulk cleaning of easiest-to-clean instruments
- Additional cleaning of hard-to-clean instruments
- Soaking & ultrasonic cleaning

Goal

Estimate time needed for high-quality cleaning

Methods

- Observations & time studies
- Excel-based modeling

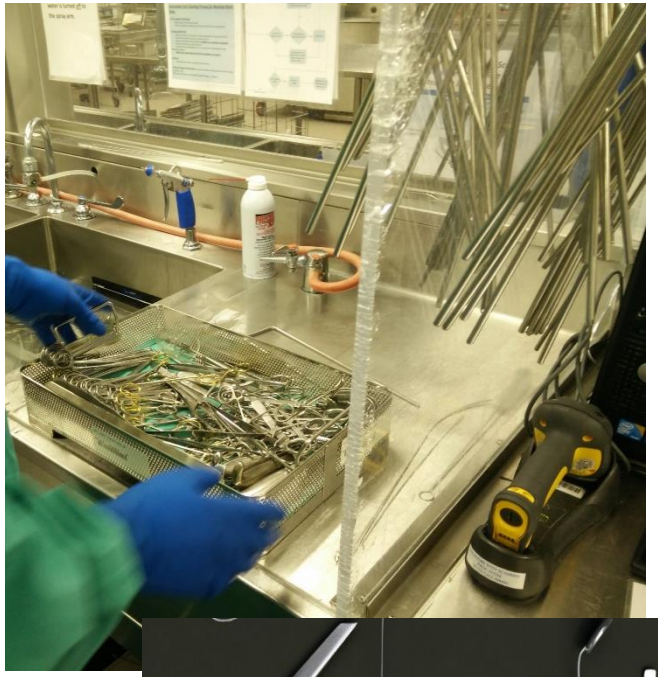
Cleaning Time Estimation

Observations:

- 12 sessions across all shifts
- 26 videos filmed

Result times (Avg+1SD):

- Bulk cleaning: 5.2min
- Hard-to-clean instrument: 6s - 60s
- Soaking & ultrasonic: 20min



Cleaning Time Estimation

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Findings and Conclusions

Most sets require around 30 minutes of cleaning time

Cleanability Index highly correlated with hard-to-clean instrument cleaning time

Variabilities between similar instruments and across different individual staff are surprisingly high

Cleaning Time Estimation

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Instrument Set Dashboard Examples:

Set Type Name:	SET, MINOR NEURO UH
Set Type ID:	500148
Usage per Month	143

Update Filters

SET, MINOR NEURO UH - 500148

Initial Configuration	SET TYPE	% sent back	# Instruments	Weight (lbs)	# Categories	Original Tray Size	Expected Cleaning Time	Cleanability Index
	Mother Set	12.5%	123	22.33	22	Large	37.76353343	184.95

Set Type Name:	SET, TRANSPHENOIDAL NEURO UH
Set Type ID:	500153
Usage per Month	143

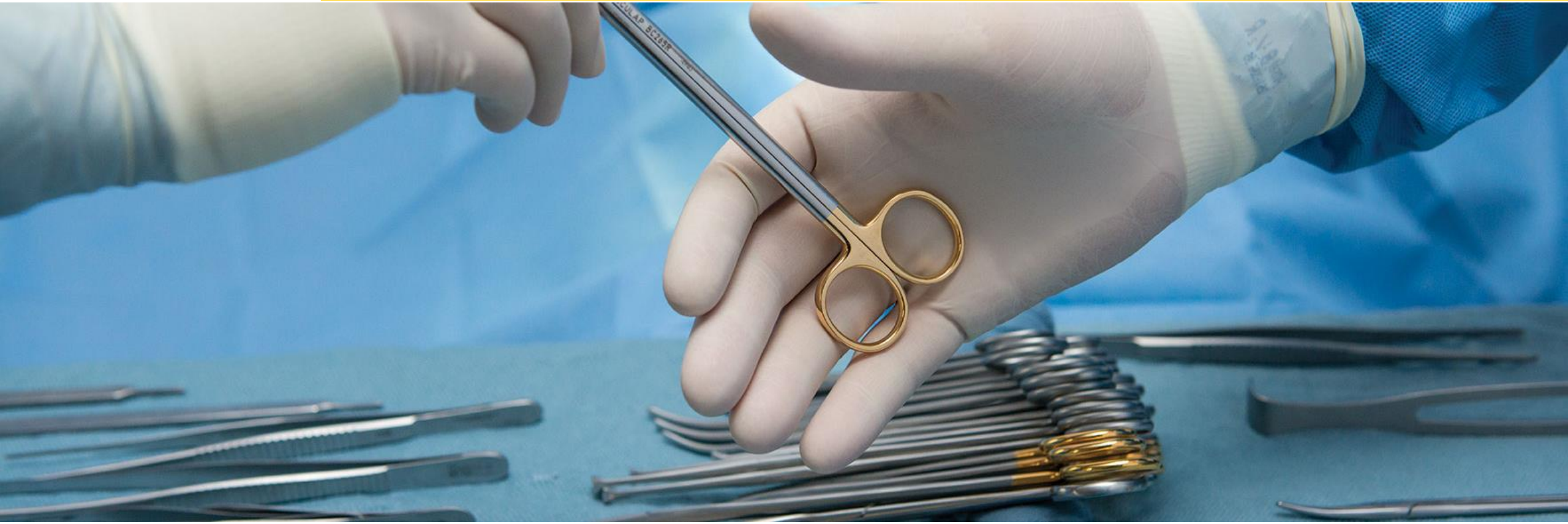
Update Filters

SET, TRANSPHENOIDAL NEURO UH - 5001

Initial Configuration	SET TYPE	% sent back	# Instruments	Weight (lbs)	# Categories	Original Tray Size	Expected Cleaning Time	Cleanability Index
	Mother Set	#VALUE!	94	0.00	25	Large	37.8052001	37.10

Potential Impact

- Institutional outcome measures potential improvements:



FUTURE WORK

Future Work

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1

- Standardize the cleaning procedures across CSPD technicians and similar instruments

2

- Expand the Instrument Set Dashboard to other instrument sets beyond Neurosurgery

3

- Use the Dashboard to identify additional bioburden-prone instruments
  - Separate these instruments to form a new set
  - Allow for more cleaning time to focus on such instruments

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Questions?

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Thank you!

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