

Utilization Fraction of Ambulatory Hand Procedures: Cost Reduction Through Instrument Tray Optimization



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BACKGROUND

- An estimated **\$760 - 935 billion dollars** are wasted annually within the healthcare industry in the United States, making it the country with the most expenditures.
- Operating rooms (OR) typically account for **60-70% of hospital operational expenses**, making efforts promoting cost-cutting in surgical services paramount.
- We evaluated the **utilization fraction (UF)** of surgical instruments during a commonly performed ambulatory hand surgery case.
- Aim for **cost reduction, increased operating room efficiency, and systems quality improvement**.

METHODS

- We assessed **utilization of surgical instruments** in ambulatory hand procedures from October 2022 through June 2023 in an urban public hospital.
 - Annual surgical volume** was determined using CPT codes (below) over a two-year period (12/1/2020-12/1/2022) and averaging the number of cases per year.
 - CPT codes for **carpal tunnel release (CTR)**, **trigger finger release (TFR)**, **open reduction and internal fixation (ORIF)**, and **closed reduction percutaneous pinning (CRPP)** were used.
- The total number of instruments opened at the start of each case was recorded.
 - Instruments were then grouped as used or not used during the procedure.
 - Used instruments were counted.
- Total sterile processing costs were estimated at **\$1.56 per instrument** according to data from our institution's central sterilization processing (CSP) department.

Instrument	# Cases Opened	# Cases Used	UF (%)	Total Opened	Total Used
needle holder, mayo-hegar, carb-bite, 6"	19	15	78.9	38	17
bipolar fcps, jewelers insulated, straight, 4"	19	14	73.7	19	14
rag nell retractor	19	13	68.4	38	25
tissue fcps, adson, 1 x 2 teeth, 4-3/4"	19	12	63.2	38	21
elevator, freer, narrow, 5mm x 7-3/4"	19	11	57.9	19	11
knife handle, # 3	19	10	52.6	38	11
clamp, allis, 4 x 5 teeth, 6"	19	8	42.1	38	11
mayo st scissor	19	8	42.1	19	8
retractor, senn, sharp, 6-1/4"	19	8	42.1	38	16
skin hook 5mm curved	19	8	42.1	38	16
littler scissor 4 1/2"	19	7	36.8	38	8
lead hand	19	5	26.3	19	5
skin hook 3mm curved	19	5	26.3	38	9
retractor, weilaner, sharp, 4-1/2"	19	4	21.1	38	5
stevens (tenotomy) st	19	4	21.1	19	4
tenotomy scissor (black-handle)	19	4	21.1	19	4
tissue fcps, adson delicate, 1 x 2 teeth, 4-3/4"	19	4	21.1	38	7
clamp, mosquito (halstead) curved, 5"	19	3	15.8	76	4
clamp, mosquito, petit-point, curved, 4-3/4"	19	3	15.8	76	3
scissor, metzenbaum, curved, 7"	19	3	15.8	19	3
stevens (tenotomy) cvd	19	3	15.8	19	3
tissue fcps, adson dressing, delicate, 4-3/4"	19	3	15.8	38	4
wire cutter, ang. dbl-action, 1.7mm(.067) max, 7"	19	3	15.8	19	3
joseph double hook 7mm	19	2	10.5	38	4
needle holder, webster, smooth, carb-bite, 4-1/2"	19	2	10.5	38	2
retractor, weilaner, sharp, 5-1/2"	19	2	10.5	38	3
rongeur, friedman, cvd. 4mm bite, 4-1/2"	19	2	10.5	19	2
towel clip, backhaus (sharp) 5-1/4"	19	2	10.5	76	4
clamp, kocher, straight, 5-1/2"	19	1	5.3	38	2
clamp, meeker rt. angle, 7"	19	1	5.3	38	2
cup, medicine, graduated, stainless, 2-oz	19	1	5.3	38	1
curette, bruns, size 2-0, straight, 6-3/4"	19	1	5.3	19	1
joseph elevator 6 1/2	19	1	5.3	19	1
retractor, mini-hohman, 6mm blade, 6-1/4"	19	1	5.3	38	1
scissor, mayo, curved, 6-3/4"	19	1	5.3	19	1
suction, frazier, ang. 10fr. 4-1/4" work length, 7 1/2"	19	1	5.3	19	1
tissue fcps, bishop-harmon, 1 x 2 t, 0.6mm, 3-1/4"	19	1	5.3	38	2

Tables illustrating utilization fraction of instruments opened in each case. Bold horizontal line represents cutoff for inclusion **in theoretical optimized tray** (instruments used at least 20% of the time when opened, or 20% UF).

Instrument	# Cases Opened	# Cases Used	UF (%)	Total Opened	Total Used
bone cutter, ruskin-liston, up-angled, 7-1/4"	19	0	0.0	19	0
bone hook, 3/8" hook, 9"	19	0	0.0	19	0
bruns curette 6 3/4" size 1	19	0	0.0	19	0
castroviejo probe dilator	19	0	0.0	19	0
clamp, crile, curved, 5-1/2"	19	0	0.0	19	0
clamp, mixer rt. angle, petit-point, 7-1/4"	19	0	0.0	38	0
clamp, mosquito (halstead) straight, 5"	19	0	0.0	38	0
clamp, r-ochsner (kocher) straight, 6-1/4"	19	0	0.0	19	0
cross action retractor (blunt)	19	0	0.0	19	0
cross action retractor (sharp)	19	0	0.0	19	0
curette, bruns, size 2, straight, 6-3/4"	19	0	0.0	19	0
dura separator-packer, woodson, dbl-end, 7"	19	0	0.0	19	0
jewelers style fcps#4	19	0	0.0	38	0
kelly clamp cvd	19	0	0.0	19	0
knife handle, beaver, knurled handle, 4"	19	0	0.0	19	0
mckenty septal elevator	19	0	0.0	19	0
needle holder, halsey, serr. carb-bite, 5"	19	0	0.0	38	0
reduction forceps 5-1/4"	19	0	0.0	38	0
retractor, mini-hohman, 8mm blade, 6-1/4"	19	0	0.0	38	0
retractor, richardson appendectomy, narrow, 9-1/4"	19	0	0.0	38	0
rongeur, blumenthal, 30-deg. 2mm bite, 6"	19	0	0.0	19	0
rongeur, ruskin, cvd. 4mm bite, dbl-action, 6"	19	0	0.0	19	0
scissor, iris, curved, carb-edge, 4-1/2"	19	0	0.0	19	0
scissor, iris, straight, carb-edge, 4-1/2"	19	0	0.0	19	0
scissor, strabismus, str. 30mm blades, 4-1/2"	19	0	0.0	19	0
sponge stick (foerster), str. serrated, 9-1/2"	19	0	0.0	76	0
strabismus scissor cvd	19	0	0.0	19	0
tissue fcps, beasley-babcock, 5"	19	0	0.0	38	0
towel clip, backhaus (sharp) 3-1/2"	19	0	0.0	76	0
tracheal hook 6"	19	0	0.0	38	0
zimmer ruler al holes	19	0	0.0	19	0
tendon interlacing forceps-str	7	0	0.0	7	0
tendon interlac fcps 5-3/4 cvd	7	0	0.0	7	0
clamp, carroll tendon pulling, curved, 5"	7	0	0.0	7	0
tendon stripper, malleable 4mm	7	0	0.0	7	0
tendon stripper, malleable 4.5	7	0	0.0	7	0
tendon stripper, malleable 5.5	7	0	0.0	7	0
tendon stripper 5mm inner dia	7	0	0.0	7	0
englert tendon grasping forcep	7	0	0.0	14	0
tendon braiding fcps single pin tooth cvd	7	0	0.0	14	0
tendon braiding fcps single pin tooth st.	7	0	0.0	14	0
tendon stripper 4mm	7	0	0.0	14	0
clamp, carroll tendon pulling, curved, 5"	7	0	0.0	7	0
tendon stripper 5mm	7	0	0.0	14	0
flexible shaft tendon stripper 4.5mm	7	0	0.0	14	0
flexible shaft tendon stripper 5.5mm	7	0	0.0	14	0

RESULTS

- Nineteen hand procedures performed by 2 surgeons were included: CTR (n=7), TFR (n=2), ORIF (n=2), and CRPP (n=2)
- Average of **120.1 ± 10.9 instruments were opened** at the start of each case, while average of **12.6 ± 5.4 instruments were used** per case. This yielded a **UF of 10.7% ± 4.8%**.
- Using our internal CSP estimate, we calculated an annual cost of **\$16,863 to reprocess the current hand tray**. Using literature data, this cost ranged from **\$5,513 - \$34,484 annually**.
- The same cost calculations were performed for the **theoretical optimized tray** containing 23.2 instruments. Annual reprocessing cost of this tray according to CSP data was **\$3,260** demonstrating **cost reduction of \$13,603 or 80.7%**.
- Overall, we estimated **annual cumulative cost savings of up to \$45,867**.

CONCLUSIONS

- Evaluation of pre-and peri-operative processes is a valuable technique for **mitigating increasing healthcare costs** and **reducing unnecessary healthcare spending**, especially as hand procedures increase in referral rates and have some of the highest rates of orthopedic ambulatory procedures.
- This is broadly applicable to multiple surgical subspecialties and procedures.

Tray	# Instrument s	# Unique Instruments	# Duplicate Instruments
Hand Surgery Tray	112	34	34
Hand Tendon Tray #1	7	7	0
Hand Tendon Tray #2	15	1	7

Surgical tray composition of nineteen hand procedures. Seven procedures utilized 3 trays, while the remaining 12 procedures opened the hand tray only.