

# PROSPECTIVE RANDOMIZED COMPARISON OF STANDARD HAND PUMP INFUSER IRRIGATION AND AN AUTOMATED IRRIGATION PUMP FOR OPERATING ROOM EFFICIENCY DURING PERCUTANEOUS NEPHROLITHOTOMY AND URETEROSCOPY



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## INTRODUCTION

Consistent irrigation is essential in optimizing the endoscopic view during percutaneous nephrolithotomy (PCNL) and ureteroscopy (URS). Operating room staff expend time and physical effort in maintaining manual hand pump (HP) irrigation in order to ensure irrigant flow. We sought to evaluate whether an automated irrigation pump (AIP) (Thermedx® FluidSmart™) would improve procedural efficiency and nurse and surgeon satisfaction regarding irrigation during PCNL and URS.

## METHODS

### Patient Selection and Study Design

- Adult patients undergoing PCNL or URS for unilateral stone disease were randomized to HP or to AIP.

### Outcome Variables

- Pump setup time: Time spent by nurses preparing the irrigation system preoperatively.
- Pump maintenance time: Time spent by nurses servicing the pump intraoperatively.
- Irrigation-related issues: The number of irrigation-related issues verbalized by the surgeon intraoperatively.
- Surgeon/nurse satisfaction: Surgeons and nurses completed a postoperative satisfaction survey (1 = highly dissatisfied to 10 = highly satisfied).

Table 1. Patient Characteristics

	URS			PCNL		
	HP (n=26)	AIP (n=25)	p	HP (n=15)	AIP (n=14)	p
Age (years)	56.8	57.8	0.7	60.1	62.4	0.7
Sex (M/F)	16/10	13/12	0.6	6/9	5/9	1.0
BMI	27.7	25.3	0.04	32.1	28.7	0.3
ASA	2.35	2.24	0.5	2.67	35	0.5
Stone Volume (cm <sup>3</sup> )	0.4	1.2	0.2	6.7	9.3	0.3

Table 2. Irrigation-Related Satisfaction

	URS			PCNL		
	HP (n=26)	AIP (n=25)	p	HP (n=15)	AIP (n=14)	p
Surgeon satisfaction (1-10)	7.9	8.8	0.07	7.3	8.9	0.05
Nurse satisfaction (1-10)	6.5	9.2	<0.001	4.4	9.4	<0.001
Irrigation-related issues	2.8	1.2	<0.001	4.0	1.9	0.07

## RESULTS

- Fifty-one patients undergoing URS were randomized (26 HP and 25 AIP). Twenty-nine patients undergoing PCNL were randomized (15 HP and 14 AIP) (**Table 1**).
- Nurse satisfaction was higher with AIP (p<0.001) (**Table 2**).
- Irrigation system setup and maintenance time were both less with AIP for URS and PCNL (p<0.001) (**Table 3**).
- Irrigation-related issues were lower when using AIP during URS (p<0.001) (**Table 2**).
- After 2 AIP cases, OR administration requested that we inform them about the pump randomization 24 hours prior to PCNL cases, so they could reduce OR staffing by one nurse for AIP cases.

Table 3. Irrigation System Outcomes

	URS			PCNL		
	HP (n=26)	AIP (n=25)	p	HP (n=15)	AIP (n=14)	p
Operation time (min)	69	76	0.5	141	131	0.9
Pump setup time (min)	3.7	2.3	<0.001	9.8	2.2	<0.001
Pump maintenance time (min)	2.3	0.6	<0.001	24.0	2.5	<0.001
Total pump time (setup+maintenance) (min)	5.9	2.9	<0.001	33.9	4.6	<0.001
Liters of irrigation fluid used	1.8	2.5	0.1	22.5	20.5	0.4
Stone Outcome						
No fragments	8 (30%)	3 (38%)	0.4	6 (43%)	6 (43%)	1
Fragments ≤4mm	8 (30%)	5 (63%)	1	7 (50%)	11 (79%)	0.2

## CONCLUSIONS

- During URS and PCNL, the automated pump resulted in a significant *decrease* in total irrigation pump management time.
- Utilization of an automated irrigation pump resulted in a statistically significant *increase* in nurse satisfaction during URS and PCNL.
- Use of an automated pump resulted in our hospital allowing for the decrease in 1 nurse full-time equivalent assigned to the operating room in PCNL cases.