

IMPROVING PERIOPERATIVE EFFICIENCY IN THE MANAGEMENT OF SURGICAL SETS FOR TRAUMA SURGERIES: THE 4S APPROACH.

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Introduction

Peri-operative management of surgical instruments and implants that comprise sets for trauma surgeries has been identified as a complex and resource-intensive activity due to non-standardized inventories, redundant instruments, and unnecessary sterilization cycles. The 4S Intelligent Trauma Care program aims to improve process efficiency by utilizing standardized inventories, a sterile implant portfolio, a barcode that enables digital safety certification, and a digitized restocking service. (1-4).

Objective

This study aimed to investigate the impact the 4S program for the management of surgical sets in open reduction internal fixation (ORIF) trauma surgeries.

Methods

This was a single-center, pre-post quality improvement study of trauma surgeries, comparing procedures performed with the current practice to those performed following the introduction of the 4S program, from November 2019 to November 2020. Due to COVID-19 restrictions on external personnel access within the hospital, the study was paused for four months between March 2020 and July 2020. This was a prospective, comparative study of ORIF trauma surgeries pre- and post-implementation of the 4S program (30 pre- and 30 post-implementation). Primary outcome was the proportion of procedures with fewer than two sterilization cycles.

Secondary outcomes were number of sterilization cycles per procedure, set processing time across departments, total set processing costs, number of missing or damaged implants, number of cleaning cycles per procedure, time taken to assemble containers for sterilization, number of containers entering the autoclave per procedure, environmental impact, number of baskets entering the cleaning machine per procedure, and staff satisfaction.

Results

Implementation of the 4S program resulted in a reduction in the mean number of sterilization cycles from 2.1 to 1.0 ($p<0.001$). Pre-implementation, only 30.0% of procedure sets were sterilized within one cycle, compared to 100.0% post ($p<0.001$). A reduction in the mean set processing time of 24.1% in the OR and 35.3% in the sterilization department was observed. Mean set processing costs pre-implementation were €81.23, compared to €50.30 post.

Abbreviations: LL, lower limit; M, median; Q1, 25% quartile; Q3, 75% quartile; UL, upper limit. $Q3 + 1.5 \times IQR$ (UL); $Q1 - 1.5 \times IQR$ (LL). Points outside the box-and-whisker plot are outliers.

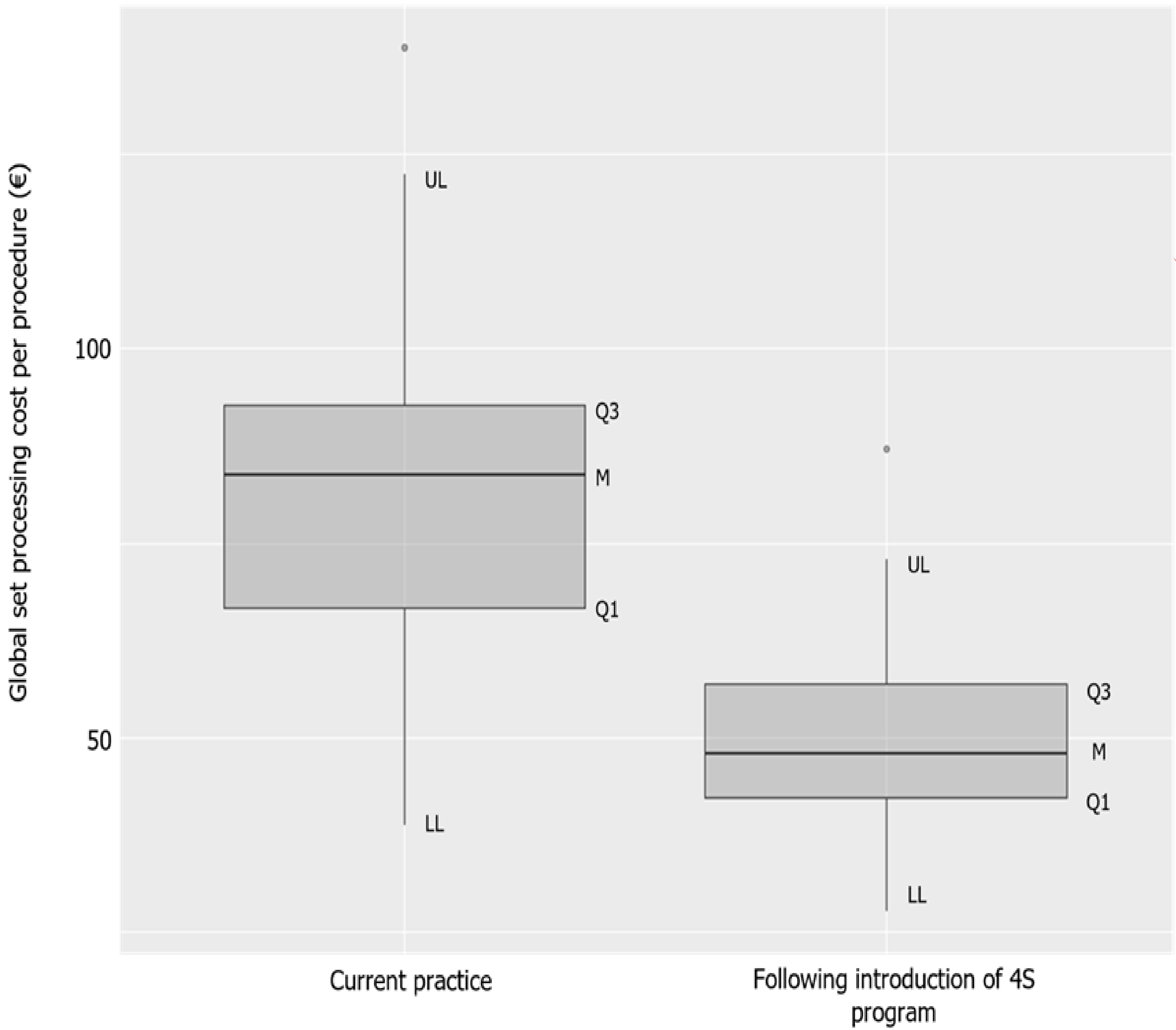
Table 1: Set processing times for cohorts with the current practice and following the introduction of the 4S program.

Set processing time in minutes, median (range)	Current practice (n=30)	Following introduction of 4S program (n=30)	p value ^a
Overall turnover time	48.6 (16.3–94.1)	39.4 (9.6–70.8)	0.014
In operating room	22.1 (3.9–49.4)	17.5 (6.4–28.0)	0.040
In sterilization department	12.3 (1.9–42.0)	8.4 (3.2–30.0)	0.005
In purchasing department	12.6 (0.0–23.9)	11.8 (0.0–31.5)	0.842

^aKruskal-Wallis rank sum test.

Furthermore, implementation was associated with significant reductions in water and electricity usage per procedure, and increased staff satisfaction.

Figure 1. Global set processing costs in the current practice and following the introduction of the 4S program.



Conclusions

This study demonstrates the substantial time and cost savings, positive environmental impact and staff satisfaction that can be achieved by streamlining surgical set management through the 4S program.

References

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