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The economic impact of individually packaged screws



Wing Yum Man*, Ashok Mukherjee, Paul Yuh Feng Lee

Trauma and Orthopaedics Department, Royal Gwent Hospital, Cardiff Road, Gwent NP20 2UB, UK

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ABSTRACT

Background: Trends in orthopaedic surgery have seen a migration towards using individually packaged screws (IPS). The manufacturers claim IPS improves sterility, traceability, and avoids the effects of repeated sterilisation. In recent times there has been increasing pressure on the NHS to be more cost-efficient. Challenging decisions must be made to make cost-efficient choices without comprising the quality of care provided.

Aim: This study investigates the cost-benefit of IPS compared to the conventional screw rack stored screws (SRSS).

Methods: A single-centred observational study was carried out in a district general hospital between February and March 2013. One-hundred and forty-seven screws were requested intra-operatively and the screw acquisition time was measured with a digital handheld timer. Screw acquisition time was defined as the time taken from the initial verbal request to when the screw was mounted ready for use. The screws were categorised into two groups: SRSS and IPS.

Results: The mean screw acquisition time for the SRSS group ($n = 94$) was 6.6 s (S.D \pm 2.5). The mean screw acquisition time for the IPS group ($n = 53$) was 102.1 s (S.D \pm 25.7). The mean difference between SRSS and IPS was 96 s (95%CI 90.3–100.8; $p < 0.001$).

Conclusion: Our study suggests that the use of IPS significantly ($p < 0.001$) increases the operation duration and costs compared to SRSS. Based on ankle ORIF procedures alone, the use of IPS could potentially increase department spending by approximately £76,680 per year.

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Introduction

In recent years, the global economy has taken a turn for the worse. Healthcare organisations around the world are tasked with ensuring their budget goes as far as possible. Management decisions impact on the process and quality of service provision. The consideration of financial cost can sometimes be overlooked by clinicians who feel the patient's safety is

paramount. This article highlights a potential source of efficiency savings without compromising the quality of care.

In surgery all instruments and supplies used must be sterile. This is particularly true in the field of orthopaedics as implants are often left in-situ. Infected implants can pose a complex management problem and is the bane of all orthopaedic surgeons. Trends have seen a migration away from traditional screw trays toward individually packaged

* Corresponding author.

E-mail address: wingyum@gmail.com (W.Y. Man).

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implants. Screw racks once opened require re-sterilisation by the decontamination unit. Concerns have been raised that the microstructure of implants may be altered through repeated cycles, and this in turn could affect their integration and stability during use.^{1,2} However, these claims have never been clinically proven.

The authors observed that requesting screws that were individually packaged triggered a series of events that could theoretically have a negative impact on the outcome. Most notably the screw acquisition time was longer than if a screw was requested from a tray. It has been shown that longer operation times can increase the risk of infection, length of stay, post-operative complications and reduce departmental productivity.^{3,4} The claimed benefits of individually packed screws (IPS) are: decreased infection rate, decreased risk of inflammatory reactions to implants, avoidance of the effects of repeated sterilisation on its biomechanical properties and its improved traceability.⁵ There has been no evidence published to substantiate these claims. Despite being costlier than their tray mounted counter-parts, they are used routinely in healthcare organisations globally. This study aims to investigate the cost-benefit of IPS compared to the conventional screw rack stored screws (SRSS).

Methods and materials

Intra-operative screw requests were timed for trauma operations in a National Health Service (NHS) district general hospital. Data was collected prospectively during the period of February to March 2013. Screw acquisition time was recorded using a digital hand-held timer. Screw acquisition time was defined as the time taken from the initial verbal request from the operating surgeon to when the screw was mounted ready for use. Data recorded also includes the grade of scrub nurse, runner, location of screw, time of operation and screw type. Attempts were made to limit the number of theatre staff and surgeons who were aware of the on-going study to avoid potential bias. IPS were kept either within theatre (Theatre IPS) or in a store room (Store room IPS). This was approximately 20 m away from the furthest orthopaedic operating room. SRSS were stored double-wrapped in linen as part of a standard orthopaedic tray. Opened screw racks were replenished at the end of surgery by the scrub nurse and autoclaved in the local decontamination unit after use. In addition to this, unused screw racks had a shelf life of one year before undergoing re-sterilisation.

Statistical analysis between the groups were performed by SPSS version 20 (SPSS Inc, Chicago, Ill). One-way analysis of variance (ANOVA) with *Bonferroni* post-hoc and was performed for screw acquisition time between groups and Cohen's D was calculated. Level of significance was established at $p < 0.01$.

Results

In total 147 screw requests were timed during the study period. Data was collected from 30 unique operations that included: an ankle open reduction and internal fixation (ORIF),

a dynamic hip screw, a femoral nail, a tibial nail, a tibia ORIF and a wrist ORIF. The screws were categorised into two groups: SRSS ($n = 94$) and IPS ($n = 53$). IPS was further subdivided into Theatre IPS ($n = 22$) and Store room IPS ($n = 31$).

No IPS requests were made out of hours (8 pm–8 am). Subsequently, no IPS requests were prepared by non-orthopaedic theatre staff. Differences of screw acquisition time for IPS between trained orthopaedic theatre staff and non-orthopaedic theatre staff could not be measured. Regarding SRSS acquisition times 64 SRSS were prepared by orthopaedic theatre staff, and 30 SRSS were prepared by non-orthopaedic theatre staff. The mean screw acquisition time was 5.4 s and 9.0 s respectively. The mean difference in screw acquisition time was 3 s ($p < 0.001$) in favour of the orthopaedic scrub nurses. Regarding the grade of scrub nurse: 10 requests were given to students the remaining 137 requests were made to staff. Examination of the screw acquisition time revealed no significant relationship. Similarly no significant relationship was found between types and brand of screws.

The mean screw acquisition time for the 94 SRSS was 6.6 s (S.D \pm 2.5), in comparison to the 53 IPS the mean screw acquisition time was 102.1 s (S.D \pm 25.7). The mean difference demonstrated 96 s longer to obtain an IPS (95%CI 90.3–100.8; $p < 0.001$) compared to SRSS. The effect size of Cohen's D for the screw acquisition time between SRSS and IPS was 5.22, which established a large effect size (>0.8) suggesting our study had sufficient power to validate its findings. Further analysis reveals the mean screw acquisition time for Store room IPS and Theatre IPS was 118.7 (S.D \pm 19.8) and 78.8 (S.D \pm 10.0) respectively (Fig. 1). A one-way ANOVA analysis with *Bonferroni* post-hoc was used to compare the screw acquisition time between the 3 groups (Table 1). The mean difference of screw acquisition time between Theatre IPS and SRSS was 72 s (95%CI 66.5–78.0). In spite of a closer proximity, screw acquisition time for Theatre IPS was significantly longer than for SRSS; $p < 0.001$. For Store room IPS the mean difference in screw acquisition time compared with SRSS was 112 s (95% CI 107–117); $p < 0.0001$. There was also significant difference ($p < 0.0001$) in screw acquisition time between the locations of the IPS; the mean difference of screw acquisition

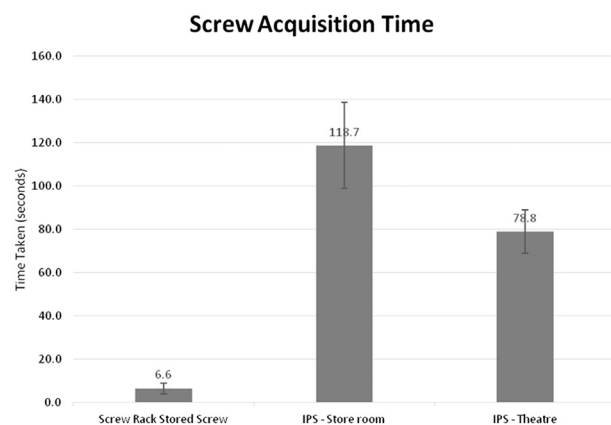


Fig. 1 – Screw acquisition times for screw rack stored screws compared to individually packaged screws (IPS) kept in theatre and IPS kept in the storeroom. There was significance difference between all 3 groups ($p < 0.001$).

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