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GETTING IT RIGHT FIRST TIME

BSSH The British Society for Surgery of the Hand

Hand surgery:

Guidelines for operating outside of main theatres

May 2022

These guidelines have been developed by the British Society for Surgery of the Hand (BSSH) and the Getting It Right First Time (GIRFT) programme. GIRFT is part of an aligned set of programmes within NHS England and NHS Improvement

They are endorsed by British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS.)

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Introduction

Whenever healthcare resources are under pressure, hand surgeons often find themselves out-competed by other specialities for operating theatre allocations and anaesthetic time. This has driven some surgeons to seek new ways of treating their patients outside of main theatres, often with less reliance on anaesthetic cover.

Success of many of these novel practices in hand surgery is now established. Forced to operate out of our usual theatre spaces, hand surgeons across the UK and beyond have developed innovative practices, demonstrating effective models of care in alternative venues. Undoubtedly there remain certain patient groups and some types of surgery, particularly the more complex, that need to remain in main theatres, with full surgical and anaesthetic teams. However the recent innovations in hand surgery have, without compromising outcome, allowed us to treat many patients faster and more efficiently than in our traditional ways of working, using smaller surgical teams, creating lower carbon footprints and generating less waste.

This guideline defines acceptable contemporary practices for performing hand surgery outside of main theatres. The recommendations are based on the available evidence, expert opinion from multistakeholder groups, consensus opinion from hand, plastic and orthopaedic surgeons and case studies of Hand Units which have successfully established such models of care.

We hope that these guidelines will inspire and encourage hand surgeons everywhere to make the case for change in their own services, striving for efficient, resilient, safe and effective hand surgery for the benefit of our patients.

Sue Fullilove

President, British Society for Surgery of the Hand (2021) and Consultant Orthopaedic Hand Surgeon at Plymouth Hospitals NHS Trust.

1 Guidelines

Key terms used in these guidelines

Main theatres are settings with all of the following features:

- a high rate of air exchange, typically ranging between 15 air exchanges per hour and laminar flow
- a positive pressure system, with vents as required
- protocols around entry and exit of staff during procedures

Non-main theatre sites are other surgical settings that do not meet all of the above criteria.

- Such facilities may be at sites remote from main hospitals, such as local care centres, community hospitals or primary care practices
- Non-main theatre sites may be adapted clinical spaces or rooms, rather than purpose built, and may be staffed by non-theatre staff, such as outpatient nurses with appropriate training.

On-site settings are where a full resuscitation team is available immediately without the need to transfer the patient to another facility.

Off-site settings are where only basic life support is immediately available and in the rare event of a medical emergency a patient might need to be transferred to an acute site via ambulance.

Simple bony procedures are procedures without implants into the bone, or procedures where implants into the bone are temporary and readily removed (eg K-wires)

Complex bony procedures are procedures where implants into bone are intended to be permanent (e.g. plate and screws, arthroplasties), where implants are not easily removed and when infection would result in serious morbidity.

1	**Bacterial Surgical Site Infection (SSI) risk is influenced by a range of factors.** Operative setting is only one of these factors and should not be considered in isolation from others, such as patient factors, cleaning routines, prepping and draping protocols, and clinical staff training and experience.
2	**Simple bony and most soft-tissue elective and emergency hand surgery** can be conducted safely in non-main theatre sites, provided other standard practices to control SSI are continued (such as appropriate room cleaning, meticulous surgical prep, adequate surgical draping, reduction of unnecessary staff numbers or movements, removal of clutter from the procedure room or theatre, etc)
3	**Complex bony elective and emergency hand surgery**: no evidence could be identified, particularly with respect to air exchange, to suggest that it was unsafe to perform complex bony elective and emergency hand surgery in non-main theatre sites. It may therefore be reasonable to proceed, provided other practices (cleaning, prepping, minimising personnel, etc) are enhanced to minimise SSI risk and are considered sufficient locally. Routine surveillance of SSI occurrence may be advisable. Otherwise, complex bony procedures should be performed in a main theatre.
4	**Handwashing**: we recommend a standard initial 3 minute surgical scrub with either water and aqueous scrub solution, or surgical alcohol rub with additional antiseptic ingredients. Between cases a further rub with surgical alcohol with additional antiseptic ingredients is sufficient.

5	**Own clothes:** There is no reliable evidence that operating on a patient in their own clothes, rather than changing into a hospital gown, increases the risk of surgical site infection in hand surgery. There is growing evidence that performing hand surgery on patients in their own clothes is both safe and practical, supported by US and Canadian studies. We would recommend adopting this approach to save resources and increase theatre efficiency.
6	**Net zero ambition:** based on the available evidence in carpal tunnel surgery, K-wiring of hand fractures and complex skin surgery, we can advise that for this type of surgery, a surgical mask, sterile gloves and suitable field sterility using a sterile wound drape are appropriate. It may also be possible to use smaller instrument sets and trays, reducing the resources used and the materials wasted. These practices can lower the carbon footprint of hand surgery and contribute to the ambition to deliver a 'net zero' NHS.
7	**Staffing numbers and skill mix** should be dependent on the location, volume and complexity of surgery and set to operate efficiently and maintain patient safety, remembering that additional people in the theatre increase infection risks. Recommended staffing levels are set out in the summary table below (Table 1.2) and should be adjusted for local factors.
8	**List scheduling** must take into account time for equipment set up and checks, staff briefings and debriefings, staff breaks, WHO check lists and other safety steps.
9	**Trainees**: Non-main theatre lists should take into account the needs and ability of any trainee assigned to the list and provide opportunities for more senior trainees to do high volume cases and gain experience of managing a theatre team and the flow of a list.
10	**Abandoned Surgery**: In the rare cases where surgery cannot be completed the wounds should be closed, and dressings and splintage applied as required. The lead surgeon must decide whether the patient should be transferred to an inpatient facility to continue the procedure on the next available list or can be brought back to clinic to discuss deferred reoperation.
11	**Medical emergencies**: Additional processes should be established for off-site surgery for managing medically unwell patients, with a Standard Operating Procedure for transferring such patients to an appropriate facility.

These guidelines may require adaptation in relation to the risk of COVID-19 or other transmissible viral infections and in response to changes in local or national processes.

1.1 Table of medical opinion on settings and infection risk

These guidelines and the table below summarise a responsible body of medical opinion on the suitability of different settings for hand surgery procedures. They are based on an analysis of the existing evidence on infection risk and consultation with multistakeholder groups. The guidelines are supported by the findings of a survey of hand surgeons, in which at least 10% considered the indicated settings below as the simplest acceptable setting.

	Settings		
Procedure The survey considered a limited range of procedures, with the assumption that these could be extrapolated to comparable procedures. For example, a setting suitable for a mucous cyst excision will likely be acceptable for a nail bed repair.	**Non-main theatre** No formal air exchange	**Non-main theatre** Formal air exchange *	**Main theatres** Formal air exchange
Open carpal tunnel release	✓	✓	✓
Trigger finger release	✓	✓	✓
Single or multiple finger Dupuytren's procedure	✓	✓	✓
Flexor tendon repair	✓	✓	✓
Mucous cyst excision	✓	✓	✓
Ulnar collateral ligament repair (without bone anchor)	✓	✓	✓
Kirschner wire fixation of fracture		✓	✓
Bone anchor placement			✓
Plate and screw fixation of fracture			✓
Prosthetic arthroplasty			✓

***** rate not specified

1.2 Summary table of staff numbers and mix

	Staff mix				
Procedure	Surgeon	Scrub staff (Band 5/6)	Runner (Band 2)	Second runner or ODP	Admitting & Discharge Nurse (Band 5/6)
No equipment / implant – OR simple case e.g. CTD / trigger finger / mucous cyst / DD	1	1*	1	0	1
With equipment / implant – OR complex case e.g. screws and plates, scope.	1	1	1	1	1

From the above team:

- At least 1 member, in addition to the surgeon, trained in Basic Life Support, and
- 1 member, trained to recognise signs of local anaesthesia toxicity, taking primary responsibility for the patient from insertion of local anaesthetic until recovery from surgery

Adjustments to factor in:

- An appropriate ratio of staff holding a specific primary or postgraduate practice qualification or experience applicable to the procedural area
- The supervision of students and trainees, who should be supernumerary to the staffing levels above.
- Increased staffing needs for high throughput lists, complex cases and accommodation of staff breaks

*** Reduction in staffing (no scrub staff) for simple lists (eg carpal tunnels) where the surgeon is comfortable with this**

1.3 Local Safety Standards for Invasive Procedures (LocSSIPs)

Local Safety Standards for Invasive Procedures (LocSSIPs) should be developed by organisations, in agreement with staff representatives. LocSSIPs must:

- Define the number and skill-mix of staff, in line with the summary table 1.2
- Define which procedures may be performed in the local facility, and on which patient risk groups, in line with these recommendations
- Specify processes for members leaving or joining the clinical team part way through an activity, and the steps necessary when teams hand over care.
- Define a process for dealing with medically unwell patients, ensuring adequate staff are available to manage that patient, and that there is easy access to a resuscitation trolley, stocked to deal with local anaesthetic (20% intralipid) and adrenaline toxicity
- Address additional processes for off-site surgery or surgery away from the main operating site, with a written Standard Operating Procedure for transferring unwell patients. This may be to the nearest hospital with an A&E department via a 999 call.

2 Case studies

The following case studies illustrate 3 units which have already successfully adopted the models of care recommended in these guidelines. In Manchester, surgery was set up out of main theatres to manage hand trauma patients during the COVID-19 pandemic. In Wrightington, an elective ambulatory unit was established to address a backlog of elective hand patients. Finally, in Saint John, Canada, the practice of undertaking hand surgery outside of main theatres was first pioneered in 1985 and their experience with over 11,000 procedures is described.

2.1 Hand trauma surgery at Manchester University NHS Foundation Trust

Manchester Foundation Trust is the largest provider of hand trauma services in Greater Manchester. It treats five thousand hand injuries per year, with approximately 2500 patients requiring surgery, which is performed by the combined orthopaedic and plastic hand surgery team.

In April 2020 the redeployment of anaesthetists and theatre staff due to the Covid-19 pandemic threatened the traditional model of operating in main theatre suites with patients mostly under GA. The Trust's response was to relocate the majority of its hand trauma service to Withington Community Hospital, where it delivers two types of trauma clinics (one for open injuries and one for closed); a 'See & Treat' service; and WALANT (wide-awake, local anaesthetic, no tourniquet) hand trauma operating. Of the 2,500 patients that needed surgery, 2,000 (80%) were done under local anaesthetic in this facility. The remaining 500 patients continued to be treated at the main site under general anaesthetic and included: children, patients unlikely to tolerate awake surgery, cases expected to take longer than 2 hours, and the majority of soft tissue injuries proximal to the wrist crease, especially where there was an expectation of structural injury deep to fascia.

The clinic for closed hand injuries is run by Senior Clinical Specialist Hand Therapists working autonomously. They assess patients and undertake conservative management where appropriate, and list patients for theatre where necessary.

The clinic for open hand injuries is run by an Advanced Clinical Practitioner (ACP) in hand trauma, working autonomously and supported by experienced plastic surgery nurses. The ACP is trained in assessment of hand injuries, consent, and minor surgery. The trauma clinic sees open hand injuries from all referring centres in Greater Manchester.

The 'See and Treat' service is delivered by the ACP and treats around 500 patients per year. The procedure room is a converted clinic room, with good light, hand washing facilities and uses field sterility. This facility caters for nailbed injuries, lacerations without injury to longitudinal structures and extensor tendon injuries.

The Trust's WALANT theatre, treating approximately 1500 patients per year, is supported by a full theatre team, and its resources include a mini C-arm, a microscope, power tools and all relevant equipment necessary for the full range of hand trauma. This service is consultant-led, 6 days per week, and delivered largely by trainees in a fully supervised, training-focused environment.

2.2 Elective ambulatory surgery at Wrightington, Wigan and Leigh Teaching Hospitals NHS Foundation Trust

In Spring 2020, most elective operating in UK was brought to a halt by the Covid-19 pandemic, and surgical waiting lists started to rise. In December 2020 the Elective Ambulatory Unit (EAU) at Wrightington Hospital opened. This site was ideally suited for providing surgical treatment during the pandemic as a designated 'green' site, where all those attending for treatment required a negative PCR test within 72 hours of admission and self-isolated before attending.

The EAU is a standalone theatre away from the hospital's main theatre suite. The unit was arranged to facilitate a circular patient flow of admission, surgery and discharge areas. Admission times were staggered and only one patient allowed in each area at a time. This maintained social distancing and allowed cleaning of each area between patients.

In the six month period from December 2020 to May 2021,530 procedures were performed in the EAU (Table 1) The team consisted of: a surgeon, trainee or fellow, 2 scrub staff (alternated between scrub and runner), an ODP, a nurse and health care assistant for admission and discharge.

In this cohort of 530 patients, there were no adverse medical events or local anaesthetic toxicity. Three patients (0.6%) suffered a vasovagal episode during either local anaesthetic injection or intra articular injection. There were 2 cases (1.3%) of superficial wound infection in patients who underwent carpal tunnel decompression and 1 wound infection (2.2%) in surgery for Dupuytren's disease. The overall risk of SSI in this cohort was 0.2%, a lower risk than previously reported in the literature for elective and trauma hand surgery (0.4% and 4% respectively). Patient satisfaction was high, with an average of 9.8 / 10 when asked to rate their hospital experience.

Table 1: EAU procedures performed between 7th December 2020 and 23rd May 2021

Operation	n= 530
Image guided injection	182
Nerve decompression	166
Excision of skin lesion	48
Dupuytren's surgery up to dermofasciectomy	46
Release of tendon sheath	24
Autologous blood injection into tendon	22
Primary fusion joint	17
Excision of bone	16
Wrist scope	4
Removal of metal	3
Joint replacement	2

2.3 Surgery in minor procedure rooms at Saint John, Canada

At Saint John, Canada, 95% of hand surgery cases are performed in three procedure rooms under local anaesthetic and 97% of cases are done using field sterility. This approach avoids unnecessary morbidities from sedation and general anaesthesia and increases convenience for patients, leading to improved patient satisfaction. It is also cost-efficient, reducing unnecessary use of main theatres and staff, as well as greener, reducing the volume of clinical waste produced.

The procedure rooms are each staffed by one reception secretary; one nurse who circulates and puts on gloves to assist when required; and one hand surgeon who acts as their own scrub nurse.

For most cases, field sterility is used, only prepping the part to be operated on, such as the palm of a carpal tunnel, and draping with 4 small towels or a towel with a central hole. For trigger finger operations, the whole hand is prepared, in order to see flexion of all the digits. Augmented field sterility is used for 3% of cases. This means wearing a sterile gown and larger drapes. These cases tend to be longer procedures (over 1 hour) that involve relatively avascular structures such as joints (trapeziectomy) tendons (transfers and grafts), or open fracture reduction with K wiring. Patients wear their own clothes for procedures, except those taking place in main theatre, where a general operating room policy requires them to change into a gown.

A maximum of 7mg/kg of lidocaine with epinephrine is used, an extremely safe dose, thus minimising the need for monitoring. For a 70 kg adult, this is 490mg, or ~ 50ml of 1% lidocaine. If more than 50 ml of volume of 1% lidocaine with 1:100,000 adrenaline is needed, saline can be added (for example, for forearm tendon transfers, up to 200 ml of 0.25% lidocaine with 1:400,000 epinephrine is used and effective for up to 3 hours). Tumescent local anaesthesia is injected until there is enough local anaesthesia visible and palpable 2cm beyond any site for cutting, K-wire or manipulation. Example doses include: 5ml for trigger finger: 15ml for carpal tunnel: 20ml for a single finger Dupuytren's: 80ml for trapeziectomy: 60ml volar / 60ml dorsal for entire wrist anaesthesia

Examples of cases that would be done wide awake, with local anaesthesia and no tourniquet (WALANT) in an office or procedure room include:

- All soft tissue operations, including skin grafting (a nitrogen tank is available and skin grafts are harvested with an electric dermatome.)
- Any nerve operation, except transfers requiring intraoperative nerve stimulation.
- Any joint, fracture or tendon operation, except those with implants intended to be permanent (joint arthroplasties, internal fixation.) In Calgary, internal fixation is also done in procedure rooms.
- Neonatal accessory digit removal in babies less than 6 weeks of age.
- Children from 4 years and older who can understand and tolerate a single 30 gauge needle prick to start the tumescent local anaesthesia.

The 5% of operations taking place in the main theatre are those which require patient sedation or anaesthesia; full operating room sterility (e.g. procedures for permanent joint implants); paediatric cases such as syndactyly release or thumb duplication; and extensive procedures such as hand degloving, major replantation or upper limb necrotizing fasciitis.

Since 1985, over 11,000 hand surgery procedures have taken place in these three procedure rooms, with an infection rate of 0.39%. There has been no case where a patient has needed to be transferred to the main operating room for general anaesthesia.

3 Further information

3.1 Hand surgery guideline development process

Title	Author(s)	Overview
BSSH Evidence for Surgical Treatment (BEST) process manual	Jeremy Rodrigues, Tim Davis.	This manual describes the standardised process by which some BSSH guidance to standardise and optimise the treatment of common hand conditions is produced.

Comments: The development of these guidelines is adapted from the BSSH's BEST guideline development process. The guideline development process aimed to rapidly review the existing evidence and generate recommendations in a multi-stakeholder group with internal reviews.

Experts were recruited from key stakeholder groups to form two Guideline Development Groups, looking at Surgical Site Infection risks in hand surgery and safe staffing levels for local anaesthetic hand surgery. These groups had input from hand surgeons, microbiologists, advanced nurse practitioners, patient representatives and GPs. See 'Contributors' below for a full list of those who provided input.

The Guideline Development Groups reviewed existing evidence and literature and sought additional input where needed. This included 2 surveys of BSSH members to find what hand surgeons considered to be within the realm of reasonable practice. In addition, the experiences at units already using these models of care was examined and used to inform the development of this guideline

3.2 Surgical hand antisepsis

Title	Author(s)	Overview
Surgical hand antisepsis to reduce surgical site infection	Tanner J, Dumville JC, Norman G, Fortnam M.	A systematic review of randomised controlled trials comparing surgical hand antisepsis. Published in the Cochrane Library, January 2016.
Surgical hand rubbing versus surgical hand scrubbing: systematic review and meta-analysis of efficacy.	Feng et al.	A systematic review of evidence comparing surgical hand rubbing and surgical hand scrubbing. Published in Injury Journal, March 2020.
Impact of methods and duration of surgical hand scrub on bacterial count: A randomized controlled trial.	Parlak et al.	A study of the effectiveness of surgical hand scrub duration and method on 180 surgical nurses and surgeons. Published in American Journal of Infection Control, May 2021.

Comments: A Cochrane review, published in 2016 evaluated the evidence for surgical hand antisepsis and concluded that there was no firm evidence to suggest that one type of scrubbing technique is better than another in reducing post-operative infection. Although the quality of the evidence was low, alcohol rubs with additional antiseptic ingredients may reduce the presence of colony forming units (microorganisms) on the skin compared with aqueous scrubs, although the number of colony forming units is a surrogate for post-operative infection. In addition, a 3 minute initial scrub was more effective at reducing microorganisms on the hand compared with a 2 minute scrub. We would therefore recommend a 3 minute pre-operative surgical scrub with a surgical alcohol rub containing antiseptic ingredients. These recommendations are further corroborated by a more recent systematic review in 2020 and a clinical trial in 2021.

3.3 Surgical site infection after hand surgery

Title	Author(s)	Overview
Surgical site infection after hand surgery outside the operating theatre: a systematic review	N. A. Jagodzinski, S. Ibish, D. Furniss	A systematic review of evidence on the incidence of infection for hand surgery done in settings other than the operating theatre, finding that though the evidence is of poor quality it suggests some types of hand surgery may be done outside the operating theatre without increasing the risk of infection. Published in the Journal of Hand Surgery in March 2017. This review was updated to 2022 by Nik Jagozinski and Anuj Mishra and there was no significant new evidence.
Surgical site infection following surgery for hand and wrist trauma: A systematic review and meta-analysis	JCR Wormald, A Baldwin, AS Shaw, H Nadama, JN Rodrigues, JA Cook, D Prieto-Alhambra, ML Costa	The authors performed a systematic review and meta-analysis of all primary studies of surgical intervention for hand trauma to identify the risk of SSI in this population. 8,003 titles and abstracts were screened, including a total of 171 studies evaluating outcomes for 30,634 hand trauma patients. Within this review, five studies were identified, totalling 1,305 patients that reported SSI for procedures undertaken outside of main theatres. There was no evidence of increased risk of SSI in these studies compared to studies of procedures performed in main theatres for patients receiving interventions for hand injury.

3.4 Safe staffing levels for local anaesthetic hand surgery

Title	Author(s)	Overview
National Safety Standards for Invasive Procedures (NatSSIPs)	NHS England	NHS England document, published in 2015, setting out NatSSIPs to standardise patient safety considerations across the NHS and LocSSIPs to harmonise across a trust or organisation. NatSSIPs are applied to all interventions where there is a potential for a 'Never Event' if safety standards are not followed, including surgical and interventional procedures performed in outpatient treatment areas and other procedural areas.
Guidelines for day-case surgery	Association of Anaesthetists and the British Association of Day Surgery	These guidelines, published in 2019, include: • All members of the MDT should be trained in day case surgery • All day surgery units should have a clinical lead with a specific interest in day surgery whose responsibilities include the development of local policies, guidelines and clinical governance. • Nurses, anaesthetic assistants and other ancillary staff levels will depend on the design of the facility, case mix, work-load, local preferences and the individual unit's ability to conform to national guidelines.

3.5 Field sterility

Title	Author(s)	Overview
Evidence-based Sterility: The Evolving Role of Field Sterility in Skin and Minor Hand Surgery.	Yu J, Ji TA, Craig M, McKee D, Lalonde DH.	Paper reviewing the published evidence on full and field sterility. They did not find evidence to support the use of main operating room sterility practices in skin and minor hand surgery. They conclude that field sterility in ambulatory procedure rooms outside the main operating room is appropriate for most skin and minor hand surgery procedures. Published in Plastic Reconstructive Surgery Global Open in November 2019.
Comments about: COVID-19: Initial experience of an international group of hand surgeons.	Kiely J, Fleet M, Tan J.	Comments on article published in Hand Surgery and Rehabilitation Journal in February 2021.
Four Ways Plastic Surgeons Can Fight Climate Change.	Brown C, Meals C.	Literature review describing evidence based, pro-climate practices that may be undertaken by plastic surgeons. Published in Plastic Reconstructive Surgery Global Open in July 2020.

3.6 Example LocSSIP

An example Standard Operating Procedure (SOP) document for the ambulatory hand surgery unit at Wrightington, Wigan and Leigh Teaching Hospitals NHS Foundation Trust is available online to download and adapt.

http://www.gettingitrightfirsttime.co.uk/fwd/hand-surgery/SOP

3.7 Areas for further development

Several topics arose during the development of these guidelines and through stakeholder engagement that were of interest but outside the scope of this document. These areas, listed below, would benefit from further research and consultation and may be addressed in a future iteration of this document.

- Paediatric hand surgery: while much of this document may be applicable and helpful for hand surgeons operating on children, these guidelines did not specifically look at paediatric hand surgery.
- Patient co-morbidities and risks: consideration of patient risks is mentioned in these guidelines, but the focus of this document is on the surgical setting.

Future innovation

These guidelines are not intended to limit future innovation in surgical settings and models of care for hand surgery. This document reflects on recently developed models and evidence and it is hoped that the NHS continues to innovate and build the evidence base.

3.8 BSSH member surveys

Two surveys of BSSH members were undertaken to sample what hand surgeons considered to be within the realms of reasonable practice, one for safe staffing levels and one for infection risks.

For the former, proposals were made on staffing levels for operating outside main theatres and distributed to all BSSH Full Members. Free text responses were invited. Eighteen surgeons responded, with a wide range of views, but there was strong feedback from several surgeons already practising these models of care that our initial proposals would result in overstaffed lists.

For infection risks, the survey was developed and deployed in REDCap and all full BSSH members could respond anonymously. Surgeons were asked which would be the simplest setting in which they would undertake specific operative procedures, based on the perceived risk of infection.

The survey had 109 respondents. The key finding for each procedure was the simplest setting considered reasonable by at least 10% of respondents. It is assumed that all more complex settings would also be safe.

Survey results: Simplest setting considered acceptable by at least 10% of respondents

Respondents n=109	**Based only on the perceived risk of infection, please select the simplest facility in which you might reasonably perform the following procedures:**
Open carpal tunnel release	Procedure rooms **without** formal air exchange
Trigger finger release	Procedure rooms **without** formal air exchange
Single finger Dupuytren's procedure	Procedure rooms **without** formal air exchange
Multiple finger Dupuytren's procedure	Procedure rooms **without** formal air exchange
Flexor tendon repair	Procedure rooms **without** formal air exchange
Mucous cyst excision	Procedure rooms **without** formal air exchange
Ulnar collateral ligament repair (without bone anchor)	Procedure rooms **without** formal air exchange
K-wire fixation of fracture	Procedure rooms **with** formal air exchange
Bone anchor placement	Day case theatres*
Plate and screw fixation of fracture	Day case theatres*
Prosthetic arthroplasty	Day case theatres*

* Day case theatres were distinguished from main theatres, based on the following definition provided to respondents: "Main theatres being defined as a theatre with at least 15 air exchanges per hour, a positive pressure system and protocols about staff entry and exit during procedures"

4 Contributors

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