

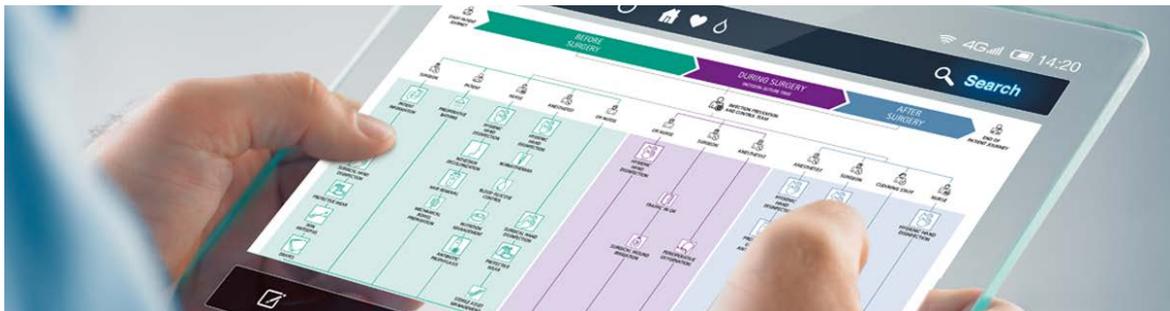
THE SSI PATHWAY

also valid during the SARS-CoV-2 pandemic

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SUMMARY ON HOW TO PREVENT SSI

Surgical site infections (SSI) remain a scourge of the medical world: They are still the most common of all nosocomial infections (25%), affecting up to 24% of all surgical patients ⁽¹⁾. Several organizations such as CDC, WHO, NHS (NICE) and RKI (KRINKO) published recommendations on how to prevent SSI. B. Braun developed a transparent and evidence-based SSI Pathway, summarizing 24 evidence-based measures performed by surgeons, operating teams and patients themselves to prevent SSI.



Experts recommend using the bundle strategy to combine particularly important measures into a bundle, training the bundle and monitoring the compliance by a checklist. As early as 2008, the WHO published a checklist for avoiding complications during operations. Through their implementation, a significant reduction in SSI was achieved in pilot hospitals ⁽²⁾. This was confirmed without exception in further studies ⁽²⁻⁹⁾.



SOPHIA (Standard Operating Procedure Health Information Assistant) supports clinicians in this aim. SOPHIA is an optimized tool for the drafting, editing and distribution of SOPs but at the same time, it serves as a digital platform linking clinics, medical associations and industrial partners. An intuitive user interface helps to update SOPs, increase utility by adding multimedia content, and distribution within clinics, - based on an adaptable team structure. SOPHIA-SSI is a monitoring tool, integrated in the SOPHIA application, to monitor the process along defined measures within the bundle strategy for prevention of SSIs. A simple software program, installed on mobile devices, may be an essential tool for rapid implementation and spread of innovative measures and procedures (www.sophia.online). A new analysis shows that the B. Braun SSI pathway supported by the use of SOPHIA-SSI is also valid during the Corona pandemic ⁽¹⁰⁾.

The authors of the guidance for elective surgery during the SARS-CoV-2 pandemic, situated in Austria, Germany, Switzerland and the UK ⁽¹⁰⁾, point to the high rate of postoperative mortality among COVID-19 patients (20%), 15% of the patients were postoperatively admitted in ICU, 51% of patients suffered

postoperative pulmonary complications associated with a 30-day mortality of 24%. This has resulted in an “urgent need” for investigations into measures that may ensure the safety of both patients and healthcare workers, especially as elective surgery procedures will hopefully soon “restart” at a more normal pace. Based on clinical experiences from a COVID-19 “hot spot” center in Germany, a 450-bed surgical clinic which immediately instigated management to prevent COVID-19 outbreaks, and the evaluation of the current scientific literature including guidelines and recommendations by the WHO, the CDC, the British National Health Service (NHS) and the German Robert Koch Institute (RKI), the authors developed a CORE CHECKLIST (AIDE MEMOIRE) to implement all known preventive measures as multibarrier strategy for safe surgery during the COVID-19 pandemic.

EXPERIENCE FROM A GERMAN COVID-19 “HOT SPOT”

The influx of COVID-19 patients initially led to a complete standstill of the surgical unit at the Diakonie Klinikum in Schwäbisch Hall, with no elective operations taking place. The three measures seen as crucial for the successful management of the COVID-19 situation were:

1. The isolation of COVID-19 patients in separate wards (made possible by the lucky chance of having available redundant wards in an old hospital building).
2. Splitting up the intensive care unit (ICU) and the intermediate care unit (IMCU) into separate entities for infected and non-infected patients.
3. The teaching and training of staff recruited to the ICU and COVID-19 wards, supported by the digital tool SOPHIA.

This tool was a continuously updated software program on the current knowledge of patient care SOPHIA® was seen as relevant particularly regarding the differentiation between SSI and COVID-19-infection, and on the ICU with respect to the decision between early and late intubation.

EXPERIENCE FROM A SURGICAL CLINIC

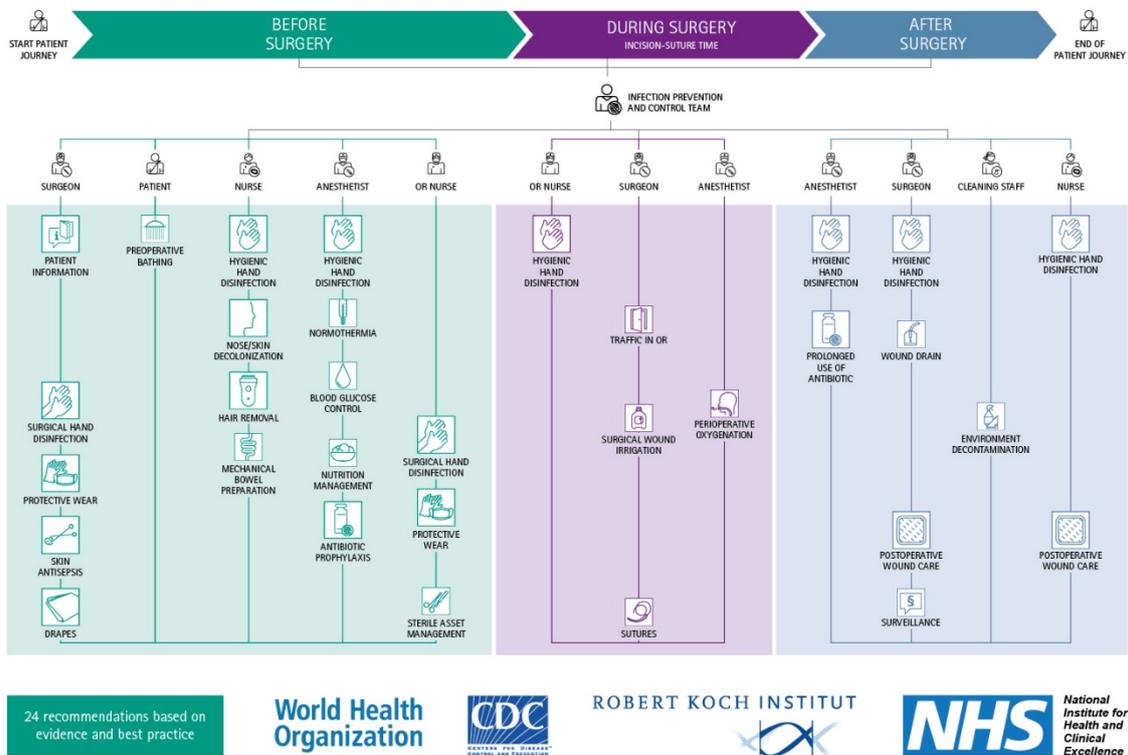
The Immanuel Hospital in Berlin developed a strategy around maintaining dedicated ICU and non-ICU areas for COVID-19 patients, while simultaneously allowing both elective and emergency surgical procedures to continue for as long as possible. Apart from creating and managing patient lists, separating infected from non-infected and suspected patients, and the implementation on quarantine of HCWs depending on their exposure to SARS-CoV-2 on the basis of a flow chart, the strategy focused on two points in particular: maintaining training and education during the pandemic, and establishing specific care structures for COVID-19 patients in the operating theatre during surgical procedures.

These care structures included screening all patients preoperatively with a PCR test and establishing three separate wards in the clinic as well as on the ICU: infected, suspected, infection-free. In addition, the care of patients had to be reorganized to allow separate surgical units; a protocol for room air-conditioning systems and guidance on personal protective equipment (PPE), respiratory and hand hygiene were implemented, as well as new rules regarding automated door opening and number of personnel in the operating theatre.

All operations were performed without transmission of SARS-CoV-2 to the surgical team.

RECOMMENDATIONS TO IMPLEMENT

The authors also provide a checklist on hospital precautions for SARS-CoV-2 patients, which are divided into general information, measures to implement before arrival, during arrival (triage system) and during surgery. For the latter, the authors recommend embedding the protective measures to prevent SARS-CoV-2 transmission to surgical patients into the hospital's **strategy** of preventing SSI. These measures (the SSI-bundle approach) should be performed as usual, regardless of whether patients have a confirmed or suspected COVID-19 infection. This requires the implementation of general recommendations for the prevention of SSI provided by WHO, CDC, NHS and RKI, summarized here:



CORE CHECKLIST (AIDE MEMOIRE) – SUMMARY ⁽¹⁰⁾

A core checklist as an “aide memoire” has been developed which focuses on the following nine categories:

- **General information SARS-CoV-2 patients – hospital precautions ⁽¹⁾**
 - For rapid implementation of recommendations within an SOP-framework and communication of innovative procedures a software program should be used, such as SOPHIA: www.sophia.online
 - The following pivotal requirements should be ensured: procurement and stock management for PPE, traceability of internal and external patient contacts, isolation of suspected and proven COVID-19 infection cases (management of “black” / “grey” areas), their reporting to local authorities, list of contact individuals, rotating teams and monitoring of COVID-19 rates.

- **Before arrival to a clinical setting/health diary and tele-triage ⁽²⁾**
 - Implement a tele-triage system, before elective surgery, as a risk assessment-tool.
 - Consider as most reliable methods in SARS-CoV-2-status assessment the PCR-test, as alternative the SARS-CoV-2-antigen test.
 - If pre-OP PCR-testing for each patient is not feasible, general procedures are to be followed, incl. a decision on PCR-testing and use of PPE.
 - Implement a five-step-triage-system
 - Triage Step 1: screening for symptoms of COVID-19 with TOCC (travel history, occupation, social contacts, household members, origin from a hot spot or cluster, contact with SARS-CoV-2 individuals).
 - Triage Step 2a: inform patients not identified as being at risk about all required procedures for infection prevention, like mouth-nose-protection, proper hand hygiene, pre-OP bathing, stop smoking and nutritional management.
 - Triage Step 2b: patients identified as being at risk should be submitted to a PCR-screening.
 - Triage Step 3: dependent on the epidemic situation of the patient’s origin, consider “reproduction rate R”-dependent triage.
 - Triage Step 4: for patients identified as SARS-CoV-2-positive, postpone surgery, if feasible, with 10-14 days quarantine. If that is not possible, consider the GRADE system for surgical decisions.

- **At patient arrival, ensure patient and staff safety ⁽³⁾**
 - Minimize risk of infection / transmission by utilizing general principles such as social and physical distancing, wearing appropriate mouth-nose-protection and proper hand hygiene.
 - In case of emergency and of non-feasibility of tele-triage, patients planned for surgery should be submitted to SARS-CoV-2-testing, temperature and pulse oximetry.
 - Implement procedures and space-areas to separate / isolate patients with different symptom-status.

- **Prevention of nosocomial spread after identification of SARS-CoV-2 in hospitalized patients or HCWs** ⁽⁴⁾
 - Implement decisions on quarantine and corresponding procedures (incl. PPE) for HCWs and their contacts to CoV-2-positive patients.
 - If possible, nurses and physicians should exclusively treat COVID-19-positive patients.
- **Spatial requirements for the operating area and operating procedure** ⁽⁵⁾
 - If possible, in surgical departments, place SARS-CoV-2 positive and negative patients into spatially separated operating areas.
 - Consider the most important aspects of "ventilation", "open surgery", "insufflation" and "robot-assisted surgery".
- **Pre- and intraoperative assessment** ⁽⁶⁾
 - Any close contact with patients should require appropriate PPE, Pre-OP antibiotic prophylaxis should be considered according to local guidelines, surgical face masks been worn and correct hand hygiene been observed, as well as a number of other precautions been followed, such as rinsing of oral cavity prior to intubation, limiting movement and number of people in OT, decisions in antivirals etc.
 - Upon completion of intubation and extubation, the surgical team should wear class II surgical face masks and face shields with a neck cover
- **Behavior in the ICU** ⁽⁷⁾
 - When applying aerosol-generating procedures, pre-procedural virucidal gargling and virucidal nasal antiseptics (spray) is recommended.
 - Allow entry of essential staff only and wear particulate respirator, together with gown, eye protection and gloves (PPE).
- **Postoperative Assessment** ⁽⁸⁾
 - Clean and disinfect personal- and patient-dedicated equipment between patients: remove any PPE respecting correct hand hygiene, hygiene-team should be trained as such as a correctly followed dress-/undress-code.
 - Dispose viral-contaminated waste as clinical waste, for needle-stick prevention use appropriate safety-container.
- **After discharge from hospital** ⁽⁹⁾
 - Provide instructions and materials to patients and care-givers on the continuous need for respiratory hygiene, cough etiquette, physical distancing, hand hygiene and mask-wearing as well as advice on home isolation, record patient's traceability data
 - All patients should wear an approved surgical mask class II postoperatively within the hospital.

You can find a more detailed summary of the checklist recommendations [here](#).

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