

Prevention of Nosocomial Infection in the Neurosciences Intensive Care Unit: Remember the Basics

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Nosocomial infection remains a major source of morbidity and mortality in intensive care units (ICU) [1]. The case mix in the neurosciences ICU is not immune to such infectious complications [2, 3]. Such infections increase both the costs and lengths of stay [4, 5]. Overall mortality rates have progressively improved over the decade, but prevalence remains high despite the advice of the Surviving Sepsis Guidelines [6]. Metrics including ventilator-associated events, catheter-related urinary tract infections, and catheter-related blood stream infections are accepted performance measures in the ICU [4]. Such infections are often associated with remuneration penalty, particularly in Medicare patients [7–9]. Although specific site of infection risks [10–12] or specific managements are defined [13], they do not necessarily lead to an overall strategy for infection control. Simple but comprehensive, cost-efficient programs [14] of infection control when uniformly and consistently applied reduce such infections in the ICU [15–19].

Murthy and colleagues in this issue of *Neurocritical Care* have reviewed retrospectively a large cohort of intracranial hemorrhage patients [20]. The prevalence of nosocomial infections was high at 26 %, most commonly due to non-neurological infections such as pneumonia, urinary tract infection, and bacteremias. Apart from older

and sicker patients being more susceptible to such infections, more specific comorbidities were not identified.

In critical care, much has been made of care bundles for routine cares to minimize nosocomial complications [21, 22]. Although the specific elements of the bundle may not decrease infectious complications, when collectively applied they typically improve outcomes. Their utility depends on their consistent application with auditing for protocol, best practice, and procedural compliance. The article by Halperin and co-investigators gives an account of a return to clinical basics to address unacceptable nosocomial infection rates [23]. The procedure and indications for urinary catheterization were reviewed and patient transport for radiological procedures minimized. This resulted in a marked reduction in both pulmonary and urinary tract infections. The measures applied reflect a comprehensive program of prevention and surveillance incorporated into the prevailing clinical culture.

However, despite all due care, hospitals care for sick patients Long lengths of stay and complex care increase the risks of nosocomial infections. The more complicated the infection control regime, the greater the potential for procedural breeches demanding direct supervision and continuous audit.

The cornerstone of any infection control strategy remains regular hand washing, the use of alcoholic hand rubs and sprays, minimizing jewelry, and bare arms to the elbows. However, achieving good compliance remains elusive [17]. Device insertion requires sterile technique and appropriate aftercare to minimize repeated access, regular site surveillance with insertion site care which ensures the use of bacterial barriers, bacterial filters, and transparent dressings. Peripheral intravenous cannulas should be changed every 72 h [7]. Minimizing the duration of use of

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indwelling devices and mechanical ventilation is well established to reduce infection rates [22].

Individual patient infection risk reduction requires an understanding of their comorbidities allowing targeted infection control strategies. Patients with advanced pulmonary disease, as an example, should have lung function optimized prior to surgery. This may include preventative regimes of chest physiotherapy, ensuring sputum clearance while minimizing atelectasis [24]. In addition, attention to intraoperative ventilator and fluid use, limiting the extent of surgery where possible, preventing wound infections and pain, and the preemptive use of noninvasive ventilation have documented utility in preventing pulmonary infections [25].

Much of the prevention of nosocomial infection relates to principles of good housekeeping included in the daily care plans with the best supporting evidence in the general ICU population [26, 27]. A culture of routine surveillance and checklists, customized to the needs of the individual patient, are valuable additions to a clinical review, forming the basis of more formal audits of practice, clinical indicators, and benchmarking [28–30]. Vincent described “FASTHUG” as an approach to routine patient review [31]. This has been validated to improve at least the documentation of care processes. Individual units have developed their own variations of this critical care “housekeeping” to prevent nosocomial complications [32–35]. A culture of regular patient review is inexpensive and creates an environment where attention is focused on the patient in context rather than just management associated with the primary condition such as head injury or intracranial bleed. An expanded approach to such checklist review includes **FASTHUG**: **F**eeding and nutrition including route and specific requirements while minimizing the use of parenteral nutrition; **A**nalgesia to ensure pain relieve and avoidance of analgesic complications such as constipation and respiratory depression; **S**edation/sleep management to improve comfort and reduce delirium; **T**hromboembolism prophylaxis; **H**ead-up measures to prevent aspiration; **U**lcer prophylaxis including stress, decubitus and device related; and **G**lycemic control. Additionally, **ON-FIDDLER** prompts for **O**rgan support with review of requirements and settings for cardiovascular and respiratory support; **N**otification of who needs to know about what, using the most efficient communication method with chart entries having legible dates, times, and signatures; **F**luid management including fluid type appropriateness, need for supplementary fluids, and the assessment of fluid deficit or excess; **I**nfection management including isolation requirements, draining collections, surveillance cultures as required with correct antibiotic use, appropriate infection prophylaxis, and antibiotic therapy duration; **D**ialysis and all things related to the kidney; **L**ines including all invasive devices, insertion indications, ongoing requirements, timing

of removal, appropriate dressings, and surveillance for device-associated complications; **D**rug review with assessment of drugs the patient is receiving, drugs the patient should be on or should have ceased, and the need for drug sheets rewrites for clarity or drug expiry; **E**lectrolytes and other investigation review; **R**esearch with respect to studies the patient is either potentially suitable for or participating in with the aim to understand the study protocol, potential side effects, and protocol violations; **r**adiology and imaging review and **r**ehabilitation including physiotherapy and all things related to discharge planning.

There have been significant reductions in nosocomial infections in surgical patients. Regular application of best clinical practice, attention to routine care “housekeeping” as part of patient review, and audits of compliance with care bundles to ensure consistency of care [36] form a comprehensive strategy to limit rates of potentially preventable infections [37]. It is time to apply this knowledge to the neurosciences ICU, research it, modify it where needed, and audit the results.

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