

Original Research Article

An Audit of the Infection Prevention and Control Program at a Regional Hospital in KwaZulu-Natal, South Africa

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Abstract: Background: Infectious diseases are the leading cause of death in South Africa. Containment strategy includes infection prevention and control (IPC) programs, microbiological resistance testing, and antibiotic stewardship programs. The current study evaluates the IPC program at the rural regional Port Shepstone Hospital. **Objective:** To use the Centers for Disease Control and Prevention (CDC's) IPC tool for acute hospitals to evaluate the infection control program at Port Shepstone Hospital. **Materials and Methods:** A prospective descriptive study was conducted from February to March 2018 at Port Shepstone Hospital. The study was conducted in two stages. The first stage determined which of the CDC's core components of an IPC program were operational. In the second stage, in 11 adult long-stay wards, nurses were identified for completion of selected elements of the CDC tool. **Results:** The IPC at Port Shepstone Hospital practices 10 of the 17 elements of the CDC's Infection Control Assessment Tool. The highest scoring ward was gynaecology (110/119 (95%)). The lowest was the psychiatric ward, which scored 64/119 (53%). There was a lack of internal auditing practices. **Conclusion:** Port Shepstone Hospital IPC program is limited as only some of the components are practised. The lack of internal auditing practices is concerning and needs improvement. To achieve the proper application of the IPC program more emphasis needs to be placed on constantly auditing existing practices and giving feedback to staff coupled with relevant training and resource support. This can be facilitated by hospital management allocating resources to IPC audit teams to audit and share findings with departments and develop quality improvement programs.

Keywords: Infection prevention and control, antimicrobials, antibiotic stewardship, hospital medicine.

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INTRODUCTION

Infection control and antibiotic stewardship are key health priorities globally and locally. In 2014, the World Health Organization (WHO) reaffirmed its call to global action and urged member states to develop or strengthen their national plans, and strategies, as well as encouraged international collaboration for the containment of antimicrobial resistance [1]. To counter antibiotic resistance, and align with the WHO's call to action, [1] the South African National Department of Health (NDoH) has created a comprehensive framework to limit antimicrobial resistance [2]. The framework includes programs for infection prevention and control, antibiotic stewardship, and microbiological resistance testing [2].

The evidence-base supporting infection prevention and control, antibiotic stewardship, and microbiological resistance testing is substantial [3-5]. Furthermore, there is extensive data demonstrating cost savings of these interventions [6]. Prevention interventions yield positive cost-benefit estimations, on average the savings of a prevention program are 11 times greater than the cost [6] and infection control strategies are relatively inexpensive [7].

Although there have been notable South African publications on antibiotic stewardship programs (ASPs) [8-11] there is a dearth of South African publications on IPC programs. Reasons for these discrepancies are unknown. There is a need to better

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understand IPC programs to prevent and control infections. The aim of the study is to evaluate the IPC program at Port Shepstone Hospital. It is envisaged that the findings will form the basis to improve Port Shepstone Hospital IPC program and supplement published studies in South Africa.

METHODS

Study Site

Port Shepstone Hospital is a regional public sector hospital located in KwaZulu-Natal, South Africa. It is a 400-bed hospital and the referral center for 19 clinics and three district hospitals. It serves a population of over 750 215 [11]. It has specialist-run departments for Internal Medicine, Surgery, Paediatrics, Obstetrics and Gynaecology, Anaesthetics, and Orthopaedics. Port Shepstone Hospital has an on-site laboratory with offsite support from microbiologists from Port Shepstone Hospital. The Infection Prevention and Control (IPC) program has a single dedicated nurse coordinator.

Ethical Considerations

Approval was granted by the University of Kwa-Zulu Natal's Biomedical Research Ethics Committee (ref. no. 424/17), Port Shepstone Hospital (ref. no. BE 424/17) and the Kwa-Zulu Natal Department of Health (ref. no KZ 201711_007).

Study Design and Description

A descriptive study was conducted at Port Shepstone Hospital between February and March 2018. The Centers for Disease Control and Prevention (CDC's) IPC tool for acute hospitals [13] was used to evaluate the IPC program at Port Shepstone Hospital. The CDC IPC tool helps determine if a hospital as an adequate IPC program. A further description of the components of the CDC IPC tool is contained below.

Part 1

The first part of the study determined which of the CDC's 17 core components of an infection control program were operative at Port Shepstone Hospital [13]. The assessment was done by the principal investigator. The assessed components were: leadership commitment, pharmacy services, laboratory services, a dedicated specialist team, infection control policy, guidelines for antibiotic use, antibiotic rotation, personal protective equipment policies, protocols for prevention of catheter-related urinary tract infections, protocols for central-line use, protocols for injection safety, protocols for prevention of ventilator-associated events, protocols for surgical site infection, services for environmental cleaning, infrastructure for isolation of contagious patients, policies for *Clostridium difficile* infection, and policies for tracking of infective patients between institutions.

Part 2

The second part of the study audited handwashing, personal protection equipment (PPE),

catheter-associated urinary tract infections (CAUTI), injection safety (IS), and surgical site infection (SSI). The CDC tool was also used to determine whether respondents knew which policies were in place, their knowledge of the protocol, the level of education and training, and existing auditing practices [13].

The participants were nurses who managed the wards. One questionnaire was selected to represent each of the 11 wards. In the situation where there was more than one questionnaire returned for a ward, then a single questionnaire was randomly selected. The sample size was determined as a census of the qualifying wards. Only adult wards with long-term patients were used. Neonatal and paediatric wards were excluded because the study investigators focused on adults.

Five of the ten sections of the toolkit were excluded from the audit. Prevention of central-line-associated bloodstream infections and prevention of ventilator-associated events were not included as this expertise is only found in dedicated units (ICU and high care). Environmental cleaning and device reprocessing are not usually performed by the nurses, but by other dedicated teams. Prevention of *Clostridium difficile* is not a common clinical entity in Port Shepstone Hospital, as per microbiological data available at the site, and no policy exists at relating to this. Due to physical hospital limitations, patient isolation is beyond the control of the nursing staff and patients with infectious diseases are placed wherever a vacant bed is available.

After collection, the data was entered into an Excel® workbook. A positive answer received a score of 1 while a negative or unknown received a 0. An arbitrary scoring system was used to grade performance as excellent (>80%), good (60 to 80%), and poor (<60%).

RESULTS

Part 1

The infection control program at Port Shepstone Hospital has 10 of the 17 CDC components (table 1). It has leadership commitment, pharmacy services, laboratory services, infection control policy, guidelines for antibiotic use, personal protection equipment, a protocol for prevention of catheter-related urinary tract infections, protocols for injection safety, protocols for surgical site infection, and services for environmental cleaning

Port Shepstone Hospital does not have a dedicated specialist team, infrastructure for isolation of contagious patients, policies for the prevention of central-line-associated bloodstream infections, policies for *Clostridium difficile* infection, antibiotic rotation, a protocol for prevention of ventilator-associated events, or tracking of infective patients between institutions.

Table 1: Components of CDC core components operative at hospital

Component	Present
Leadership commitment	Yes
Pharmacy services	Yes
Laboratory services	Yes
Infection control policy	Yes
Guidelines for antibiotic use	Yes
Personal protection equipment	Yes
Protocol for prevention of catheter-related urinary tract infections	Yes
Protocols for injection safety	Yes
Protocols for surgical site infection	Yes
Services for environmental cleaning	Yes
Specialist team	No
Infrastructure for isolation of contagious patients	No
Policy for prevention of central-line associated bloodstream infections	No
Policies for <i>Clostridium difficile</i> infection	No
Antibiotic rotation	No
Protocol for prevention of ventilator-associated events	No
Tracking of infective patients between institutions	No

Part 2

A total of 18 questionnaires were returned from respondents (7 of the wards had 2 respondents). The maximum possible total score was 119.

The highest scoring ward was the gynaecology ward 110/119 (95%). The lowest scoring ward was

psychiatry 64/119 (53%). Eight wards had excellent performance (>80% (>95/119)): High care, ICU, Postnatal, Gynaecology, Labour ward, Surgical male, Surgical female, and Orthopaedic wards. Two wards had a good performance (60%-80% (71-95; 119)): Medical male and Medical female (table 2).

Table 2: Ward performance

Performance	Ward
Excellent (> 80%)	High care, ICU, Postnatal, Gynaecology, Labour ward, Surgical male, Surgical female, and Orthopaedic ward
Good (60-80%)	Medical male, medical female
Poor (< 60%)	Psychiatry

Comparison of 11 wards in five components

- Handwashing:** There were a total of 15 questions in the handwashing section. The questions related to education, availability of handwashing supplies, auditing, and the feedback process. The score ranged from 11 to 15 (68% to 100%). The worst performing sections were because of poor initial education, and poor auditing feedback.
- Personal Protective Equipment:** There were a total of 19 questions in the PPE section. Questions related to the availability of PPE, training, and education in use, auditing on usage and feedback to respondents, and mandatory tests to determine the functionality of the equipment. The score ranged from 16-19 (84% to 100%). The worst scoring questions were because Port Shepstone Hospital did not have a respiratory protection program.
- Catheter-Associated Urinary Tract Infections (CAUTI):** There were a total of 38 questions in the CAUTI section. The scores obtained ranged from 20 to 34 (52% to 89%). Questions related to initial training, auditing and feedback on competence, daily assessment of patient needs, and collection of hospital data regarding CAUTI. Port Shepstone

Hospital does not have a system in place for a CAUTI database and there is no ongoing collection of data and thus no dissemination of information back to the wards.

- Injection Safety:** The Injection Safety section comprised a total of 16 questions. The score ranged from 10 to 14 (62% to 87%). Questions in the audit related to training in preparation and technique, awareness of the audit process and feedback, and policy to identify tampering or alteration of medication. Wards lost marks mostly due to a lack of any protocol to identify tampering and ongoing education.
- Surgical Site Infections:** The Surgical Site Infections (SSI) section encompassed 31 questions. The lowest score was 0 and the highest 31 (0% - 85%). Questions related to whether policies were in place, use of prophylactic antibiotics, auditing processes, use of surgical draping, and patient isolation. This section heavily skewed the overall score as non-surgical wards did not know the process so could not answer questions at all. The surgical wards did not have an auditing process.

DISCUSSION

Port Shepstone Hospital has an IPC program that fulfils some of the expectations of a comprehensive program. Port Shepstone Hospital's current IPC program can be expanded and modified to upgrade its policies to an international standard. More difficult to overcome are issues relating to infrastructure and specialised teams. A key learning point is that crafting an IPC program is only the first step, constant auditing and review will help develop good infection control and prevention practices. A review of literature deems the study the first published IPC program audit at a Regional Hospital in South Africa.

Regarding IPC, the best overall performance was in the handwashing section. This finding mirrors that of Villanueva *et al.*, [14] who reported handwashing the best overall performance in both high, low- and middle-income countries. The study differed from ours as they focused on paediatric settings and respondents were medical doctors. It is not surprising that the best overall performance was in handwashing as medical professionals are trained on these aspects during undergraduate and postgraduate training. However, nurses are likely to respond positively to these questions as they are aware of what's expected of them *i.e.*, to adequately wash hands. In practice, this may be suboptimal as wards are at times without appropriate handwashing soaps and high workloads may impact the practicability of washing hands between patients. Ideally, individuals need to be directly observed to monitor compliance with handwashing, but this is not without challenges, as individuals may modify their routine behaviour when being observed, as per the Hawthorne effect [15].

The hospital does not have a respiratory protection plan. This is needed to prevent staff from contracting respiratory tract infections from patients in the hospital, especially given the high burden of pulmonary tuberculosis and the recent COVID pandemic.

The worst performance was in the monitoring of surgical site infections. It must be noted that in the author's experience patients with surgical wounds are found in all the long-stay wards and there is an expectation that the nurses in all the wards should be able to manage these wounds. The monitoring of surgical site infections, beyond the surgical wards, requires greater investment in training and upskilling to improve on the current finding.

Wards with a surgical focus performed the best as they have constant experience with managing surgical wounds and thus IPC is critical to preventing and controlling infections and has likely become routine in these wards. We need to further explore reasons for excellent performance from wards with a surgical

focus; this may help to transfer knowledge and skills to non-surgical-focused wards.

The Psychiatric ward performed poorly. The psychiatric ward usually does not manage patients that have acute infectious diseases. Patients with acute infections and psychiatric issues tend to be managed primarily by other disciplines (e.g. Medical), and co-managed by Psychiatry. Another reason for sub-optimal ward performance was a lack of substantial ongoing auditing which would have identified this gap and attempted to address it by providing feedback on the training of staff.

Inadequate auditing practices were pervasive in all wards; the trend has also been reported by Villanueva *et al.*, [14] Auditing is required to improve the current IPC program of Port Shepstone Hospital. Although it is time and resource intensive, the benefits are significant.

It is challenging to contextualise our audit findings relative to other South African studies, as we could not find similar published data. Local studies have evaluated IPC programs for tuberculosis [16-18] and specific aspects of IPC programs, as opposed to its entirety eg only central-line-associated bloodstream infection prevention [19].

From an African perspective, Kamar *et al.*, [20] reported on IPC programs at three tertiary hospitals in Sierra Leone. The authors used the WHO IPC and assessment framework tool to assess IPC compliance. All three hospitals scored a basic IPC compliance grade and major challenges relating to access to clean water, lack of examination gloves and inadequate face masks. In comparison, Port Shepstone Hospital Hospital did not have these challenges.

The first WHO global survey on IPC has been recently published [21]. The global survey described the implementation of IPC programs, by means of a questionnaire directed at IPC professionals from 81 countries. Although the study was limited by selection, recall, and reporting bias, it provides a glimpse of IPC program implementation. High-income countries fared better than low- and middle-income countries. South Africa is considered a middle-income country and our audit findings resonate with the global study indicating that we have room to improve the current IPC program at Port Shepstone Hospital.

LIMITATIONS

This was a descriptive study and was not designed to determine the statistical significance or determine what an adequate sample size should be, as it was an audit of a single institution with convenience sampling. Only nurses were chosen to complete the audit despite other disciplines like medicine, pharmacy, and laboratory services being important stakeholders.

Some wards e.g., ICU, were omitted. Descriptive statistics of the respondents were not collected and therefore not included in the results. Unknown responses were coded the same as negative response; this may have incorrectly skewed results.

This study describes the situation in Port Shepstone Hospital; it may not lend itself to generalisation as other institutions may not have similar facilities or resource constraints. Other reasons limiting the generalisability of findings include selection and recall bias. The Hawthorne effect may have also impacted questionnaire completion.

CONCLUSIONS

South African literature is limited and tends to favour Antibiotic Stewardship Programs above IPC programs. The integration of IPC programs and antimicrobial stewardship programs is essential in preventing morbidity and mortality in the South African regional hospital setting. Core strategies and coordination of audits and research on IPC programs are in the early stages. This research has demonstrated that a regional hospital in the public sector of South Africa can have an IPC program that fulfils some of the expectations of a developed country's program. Port Shepstone Hospital's current program can be expanded and modified to upgrade its policies to an international standard. More challenging to overcome will be issues relating to infrastructure and specialised teams of staff. To achieve the proper application of the IPC program more emphasis needs to be placed on constantly auditing existing practices and giving feedback to staff coupled with relevant training and resource support. This can be facilitated by hospital management allocating resources to IPC audit teams to audit and share findings with departments and develop quality improvement programs.

Recommendations: Internal auditing is required to improve the current IPC.

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