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An audit of the use of isolation facilities in a UK National Health Service trust

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Summary To aid the ongoing battle against hospital-acquired infection in the UK, all acute National Health Service (NHS) trusts should have audit data about how dedicated isolation beds within the trust are being used. In a previously published audit, we demonstrated that one-third of patients admitted to a dedicated isolation room in Tayside were not thought to be an infection risk by experienced healthcare staff. Since this audit, Tayside's isolation facilities have moved from a small peripheral 'fever' hospital to a large central teaching hospital site. At the time of this move, and using the above audit data, we designed and implemented a guideline for general practitioners and hospital doctors regarding the admission of patients to an isolation bed. The aim of this study was to compare the use of isolation beds before and after the move to the new facilities, which we anticipated would increase the demand for isolation. The results show that by all three criteria used, the utilization of isolation beds has deteriorated following the move, mainly due to the increased admission of general medical 'boarders' and low-risk infection patients. At a time when hospital-acquired infections are increasing, NHS trusts should ensure that dedicated isolation beds are used appropriately.

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Introduction

The emergence of the severe acute respiratory syndrome demonstrated the high morbidity and mortality that patients and staff can suffer if

appropriate infection control interventions, including isolation, are not undertaken.¹ Patients and healthcare staff are also at risk from many other more common infections, such as chickenpox, *Escherichia coli* 0157, methicillin-resistant *Staphylococcus aureus* (MRSA) and multi-drug-resistant tuberculosis.² Isolation facilities, however, can only contribute to a reduction in the transmission of infections in hospitals if appropriate patients are targeted. We have demonstrated previously, in a

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prospective survey of the use of dedicated isolation facilities in a UK teaching hospital, that this is not always the case.³ This survey showed, for example, that one-third of patients admitted to a dedicated isolation room were not thought to be an infection risk by experienced healthcare staff.

Our previous survey was performed on the infection unit at Kings Cross Hospital, the old Dundee 'fever' hospital, prior to the transfer of the region's dedicated isolation facilities to Nine-wells Hospital, a 1000-bed university teaching hospital. This facility had 10 isolation and 12 open-bay beds and was open 24 h/day to unselected infection admissions from primary and secondary care. The new facility has 14 isolation and four open-bay beds and is open to primary care between 9 am and 5 pm during weekdays. Out of hours, infection patients are usually admitted to the medical admissions unit unless they are considered to be high risk (e.g. chickenpox or pulmonary tuberculosis). Patients are subsequently transferred to the infection unit.

It was our perception that the transfer of services to the more accessible central site would increase the demand for isolation, especially from specialities such as haematology and surgery. A guideline for the admission of patients to the new facility was therefore developed and disseminated to general practitioners and hospital staff (Table I). The aim of the present study was to analyse the use of isolation beds one year after the opening of the new facility, and to compare this with the results of our previous audit.

Method

A two-month prospective survey during February and March 2003 was performed. A trained medical student collected data daily (except at weekends). The initial diagnosis prompting admission to the isolation facility, basic demographics and other relevant clinical details were recorded. All patients admitted to a dedicated isolation bed were

Table I Guidelines for the admission of patients to the infection unit

Infections requiring isolation

Suspected/proven enteric infection, e.g. *Escherichia coli* 0157 and hepatitis A

Varicella-zoster virus infection, i.e. chickenpox^a and shingles (other droplet/airborne spread viral infections, e.g. measles^a and influenza, are also appropriate)

HIV-positive or 'high-risk' patients with respiratory tract infection requiring exclusion of tuberculosis and/or an induced sputum for PCP

Suspected/proven pulmonary tuberculosis^a, particularly if multi-drug resistance (MDR-TB) is suspected (MDR-TB must be admitted to one of the negatively pressurized isolation rooms)

Patients with other resistant organisms (mostly infection, but some colonization if isolation in the ID unit is requested by the infection control team) at high risk of transmitting to other patients, e.g. a patient with a productive cough and confirmed penicillin-resistant pneumococcal pneumonia

Fever within three weeks of travel to an area where there is a risk of viral haemorrhagic fever^a, in particular sub-Saharan Africa

Herpes-simplex virus and other contagious skin infections (e.g. impetigo), particularly if extensive/severe such as in eczema herpeticum

Patients requiring 'protective' isolation may be admitted to one of the isolation cubicles if a suitable bed is not available on one of the oncology/haematology wards or if the patient poses a significant risk to other vulnerable patients (e.g. chickenpox or shingles)

The following infections do not always require isolation but may benefit from ID nursing and medical expertise, and can be discussed with senior ID staff who will arrange admission, depending on risk assessment and bed status

Suspected/proven viral or bacterial meningitis/encephalitis

Severe community-acquired pneumonia if the respiratory unit is full

Skin, soft tissue and bone infections, particularly if *Streptococcus pyogenes* is suspected/proven or if the patient is suitable for the outpatient and home parenteral therapy service

Bacterial tonsillitis, particularly if *S. pyogenes* is suspected/proven (suspected quinsy should be referred to Ear, Nose and Throat Department)

Glandular fever

Severe sepsis or septic shock of any cause

Extrapulmonary tuberculosis

Pyrexia of unknown origin

Other patients may also be appropriate—please discuss with ID staff

HIV, human immunodeficiency virus; PCP, *Pneumocystis carinii* pneumonia; ID, infectious diseases.

^a Ideally these infections should be admitted to one of the negatively pressurized isolation rooms.

included. Data were collected using a pre-piloted data collection form, and were subsequently transcribed to an Excel database. Two members of the study team assessed the appropriateness of each isolation episode independently according to the following criteria.

- (1) Infection or non-infection—i.e. whether the patient was suspected or proven to have an infection by healthcare staff on admission.
- (2) Infection risk or non-infection risk—i.e. whether the patient was a potential communicable infection risk at the point of admission according to the Tayside Health Board's infection control guidelines.⁴
- (3) Appropriate or inappropriate admission—according to the local guidelines for admission to the new facility (Table I).

To allow comparison, data from our previous audit (February-May 2000) were re-analysed according to the above criteria. Statistical analyses were performed using Excel and SPSS for Windows (version 10). Where appropriate, percentages and 95% confidence intervals are presented. χ^2 test was used to compare the use of isolation facilities before and after the transfer.

Results

During the study period, 112 patients were admitted to the infection unit. Of these, 98 patients (54% female) were isolated in a designated isolation room. These patients used 808 bed-days, with a bed occupancy of 98%. Of the isolated patients, only 44% ($N=44$) were considered to be a potential communicable infection risk, although 83% ($N=81$) were thought to have an infection and 80% ($N=78$) were appropriately admitted according to the local admission guidance (Table I). Patients thought not to have an infection used 99 bed-days (12% of total

bed-days). Patients thought not to be an infection risk used 418 bed-days (52% of total bed-days). Table II summarizes these results and shows comparisons, using the same criteria, with our previous audit cohort. Table III shows a comparison of admission diagnoses before and after implementation of the local admission guidance.

Discussion

By all three criteria, the utilization of the dedicated isolation facilities deteriorated following the transfer of services from a small peripheral to a large central site. Although approximately 80% of patients were deemed to have been admitted appropriately according to our local admission guidance (Table I), many of these patients had low-risk infections, with less than half of all patients thought to be an infection risk. In contrast, prior to the transfer, 90% of patients would have been admitted appropriately according to the admission guidance, with over two-thirds of patients thought to be an infection risk. This deterioration appears to be due to three main factors. Firstly, a higher proportion of isolated patients had low-risk infections, in particular, lower respiratory or urinary tract infections. Secondly, a higher proportion of patients had non-infection, general medical diagnoses. Thirdly, there was a fall in the proportion of patients with gastroenteritis. Whether the latter represents a true reduction in incidence or a change in referral pattern is unknown. Further investigation is merited to ensure that patients with infectious diarrhoea are not being housed inappropriately on open wards.

Almost all of the patients with general medical diagnoses were transferred to the infection unit as 'boarders' under the care of a non-infection, general physician during a period of high bed pressure in the hospital (usually at night or over

Table II Appropriateness and infection status of patients admitted to isolation rooms at Kings Cross and Ninewells Hospitals

	Patients admitted to isolation rooms					
	Appropriate admission	Inappropriate admission	Infection risk	Non-infection risk	Infection diagnosis	Non-infection diagnosis
Kings Cross Hospital ($N=239$)	216 (90.4%)	23 (9.6%)	163 (68.2%)	76 (31.8%)	228 (95.4%)	11 (4.6%)
Ninewells Hospital ($N=98$)	78 (79.6%)	20 (20.4%)	44 (44.9%)	54 (55.1%)	81 (82.7%)	17 (17.3%)
χ^2 test	7.26		15.93		12.96	
P value	0.007		0.0001		0.003	

Table III Initial diagnoses of patients admitted to isolation rooms

	Kings Cross Hospital (N=239)			Ninewells Hospital (N=98)		
	Number of patients	Percentage (95% CI)	Number considered to be an infection risk (% of each diagnosis)	Number of patients	Percentage (95% CI)	Number considered to be an infection risk (% of each diagnosis)
Gastroenteritis	59	24.5 (19.5-30.5)	59 (100)	5	5.0 (1.5-11.5)	5 (100)
LRTI	24	10.0 (6.5-14.5)	3 (12.5)	17	17.5 (10.5-26.5)	3 (17.5)
Soft tissue infection	24	10.0 (6.5-14.5)	13 (54)	15	15.5 (9.0-24.0)	7 (16)
Meningitis	21	9.0 (5.5-13.0)	21 (100)	3	3.0 (0.5-8.5)	2 (46.5)
HIV + respiratory illness	17	7.0 (4.0-11.0)	17 (100)	2	2.0 (0.5-7.0)	2 (100)
VZV infection	16	6.5 (4.0-10.5)	16 (100)	3	3.0 (0.5-8.5)	3 (100)
MRSA infection	11	4.5 (2.5-8.0)	11 (100)	9	9.0 (4.5-16.5)	9 (100)
General medical diagnoses	11	4.5 (2.5-8.0)	0 (0)	16	16.5 (9.5-25.0)	0 (0)
UTI + pyelonephritis	11	4.5 (2.5-8.0)	2 (18)	8	8.0 (3.5-15.5)	1 (12.5)
Febrile traveller	8	3.5 (1.5-6.5)	5 (62.5)	2	2.0 (0.5-7.0)	2 (100)
Tuberculosis	6	2.5 (1.0-5.5)	5 (83.5)	6	6.0 (2.5-13.0)	6 (100)
Osteomyelitis/septic arthritis	6	2.5 (1.0-5.5)	0 (0)	1	1.0 (0-5.5)	0 (0)
Tonsillitis	4	1.5 (0.5-4.0)	3 (75)	0	0.0 (0-3.5)	0 (0)
HIV + non-respiratory illness	3	1.5 (0.25-3.5)	1 (33.5)	2	2.0 (0.5-7.0)	2 (100)
Prosthetic device infection	3	1.5 (0.25-3.5)	1 (33.5)	1	1.0 (0-5.5)	0 (0)
Acute viral hepatitis	3	1.5 (0.25-3.5)	3 (100)	1	1.0 (0-5.5)	0 (0)
HSV stomatitis	2	0.75 (0.1-3.0)	2 (100)	0	0.0 (0-3.5)	0 (0)
Pyrexia of unknown origin	2	0.75 (0.1-3.0)	0 (0)	4	4.0 (1.0-10.0)	0 (0)
Miscellaneous infection	8	3.5 (1.5-6.5)	1 (12.5)	3	3.0 (0.5-8.5)	2 (66.5)

LRTI, lower respiratory tract infection; VZV, Varicella-zoster virus; HSV, herpes simplex virus; UTI, urinary tract infection; MRSA, methicillin-resistant *Staphylococcus aureus*; HIV, human immunodeficiency virus.

the weekend). From our own experience and that of others, it would seem unlikely that other more appropriate (i.e. higher-risk) patients were not available for transfer either from the medical admissions unit or other parts of the hospital. Unpublished audit data from our own hospital have suggested that if side and isolation rooms were used more appropriately, the vast majority of patients deemed to be at high risk of transmitting an alert infection could be housed in a side or isolation room. Such findings highlight the difficulty of implementing ideal infection control practice in a 'real-world' environment.

A more dynamic approach to bed management with improved recognition of the importance of considering infection control issues when housing patients and the use of 'real-time' information technology could potentially improve isolation room use. Although our local guidance for admission of patients to isolation accommodates some lower-risk infection patients, such as those with severe community-acquired pneumonia, the increased proportion of patients with low-risk diagnoses is likely to represent the common misconception that infection units are for patients with any infection. Following this audit, one of the senior infection unit staff attends the medical admissions unit on a daily basis to liaise with the admitting medical team and nursing staff, and to assess and prioritize admission to the infection unit. Anecdotally, this approach appears to have improved the use of isolation beds, although further audit will be required to confirm this.

The findings also highlight the difficulty in changing professional behaviour when implementing guidance, particularly if external barriers exist, such as high bed pressures.⁵ Our local guidance for

admission to the infection unit was disseminated in paper format to general practitioners and relevant hospital staff and wards. The guidance was also presented at medical unit meetings. It is increasingly recognized, however, that a multi-faceted approach (e.g. a combination of reminders, feedback and interactive educational sessions, etc.) may be required for successful implementation.⁶

In conclusion, these data show deterioration in the use of dedicated isolation beds following the transfer of facilities to a central teaching hospital site, mainly due to inappropriate admission of low-risk and general medical patients. In an era when nosocomial infection is increasingly important, National Health Service trusts should ensure that dedicated isolation facilities are used appropriately.

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