

In response to an inquiry from NHS Lanarkshire

Number 63 November 2016

What is the evidence for the clinical and cost effectiveness of single room only wards in hospitals compared with non-single room only wards?



## What is an evidence note

Evidence notes are rapid reviews of published secondary clinical and cost-effectiveness evidence on health technologies under consideration by decision makers within NHSScotland. They are intended to provide information quickly to support time-sensitive decisions. Information is available to the topic referrer within a 6 month period and the process of peer review and final publication of the associated advice is usually complete within 6–12 months. Evidence notes are not comprehensive systematic reviews. They are based on the best evidence that Healthcare Improvement Scotland could identify and retrieve within the time available. The reports are subject to peer review. Evidence notes do not make recommendations for NHSScotland, however the Scottish Health Technologies Group (SHTG) produces an Advice Statement to accompany all evidence reviews.

## Literature search

A systematic search of the secondary literature was carried out between 15–19 May 2016 to identify systematic reviews, health technology assessments and other evidence based reports. Medline, Medline in process, Embase, Cinahl, Web of Science, Health Business Elite and Health Management Information Consortium databases were also searched for systematic reviews and meta-analyses.

The primary literature was systematically searched between 15–19 May 2016 using the following databases: Medline, Medline in process, Embase, Cinahl, Web of Science, Health Business Elite and Health Management Information Consortium.

Searches were limited to the English language and literature published from 2006 onwards.

## Key points

- In 2010, the Scottish Government stated that, for new hospitals, “100% single room provision is clinically appropriate in most clinical settings”.
- The available evidence comparing single room with non-single room only wards is heterogeneous in terms of patient populations, comparators and outcomes and is limited in both quantity and quality for most outcomes of interest
- It is not possible to draw firm conclusions regarding the clinical effectiveness of single rooms.
- In many studies, patient preference favoured single rooms, although there was variation by patient characteristics such as age and illness severity and according to previous inpatient experience. This makes it difficult to reach a robust conclusion.
- Further research is required to determine the effects of single rooms on safety outcomes and the characteristics of patients who are most likely to benefit.
- No relevant cost-effectiveness studies were identified.

Key websites were searched for guidelines, policy documents, clinical summaries and economic studies.

Concepts used in all searches included: single bed wards, single patient room, private room.

In accordance with the requirements of the topic referrer, we excluded studies which looked at maternity, paediatrics, critical care, acute mental health or infectious diseases. A full list of resources searched and terms used are available on request.

## Introduction

In 2010, the Scottish Government (SG) stated that, for new hospitals, “100% single room provision is clinically appropriate in most clinical settings”<sup>1</sup>. This statement is based on an expert consultation exercise which followed a review of the European Union (EU) Health Property Network report, Hospital ward Configuration: Determinants Influencing Single Room Provision. This EU report summarised the literature on single rooms up to 2004 and reported a lack of robust evidence. Following the review of the EU report, a steering group was set up in 2006 to gather further evidence in the Scottish context. In 2008, the SG undertook a literature review, a public attitude survey, a nurse staffing report, a financial impact study<sup>2</sup> and, in 2008-2009, conducted a Delphi consultation exercise to identify in which patient specialties single room provision should be mandatory<sup>3</sup>.

Examining the literature reviewed by SG, it appears that the scientific evidence was limited; the literature that featured most was from 2004 and the steering group concluded: “There is much evidence surrounding the benefits of single room accommodation, particularly from an infection control perspective, but the majority of this evidence is not robust or scientific and it is clear there is a lack of evidence around the actual ratio of single rooms per ward/hospital that are required”.

The public attitude survey consisted of 990 interviews with Scottish adults. The largest group said they would prefer to stay in a single room should they be admitted to hospital (41%), 27% didn't mind, 22% chose a small multi-bed room for fewer than six patients and 3% would choose a large, multi-bed room for more than six patients. The nurse staffing report concluded that the isolation (that is, where patients are more dependent on nursing care, where patient mobility is reduced or where greater levels of supervision are required) some patients may feel as a result of being in a single room could be counteracted by “adequate staffing levels and appropriate design”. The financial impact study concluded that the potential revenue impact from single room provision/increased bed spacing, as a proxy measure, could be up to 2.5% of overall running costs. Based on increased bed spacing, capital cost increases were estimated at

approximately 0.5% to 3% for large hospitals and approximately 1% to 5.5% for smaller hospitals<sup>2</sup>. The Delphi consultation identified that, for some patient characteristics, single rooms were not always appropriate. The characteristics were for patients who: may deteriorate quickly and without warning; were not mobile and in hospital for a few days; have had major surgery and a dramatic change to their appearance, were being rehabilitated, were long stay<sup>3</sup>.

Other parts of the United Kingdom (UK) have released statements on single room provision. In a 2004 House of Commons written answer, the UK Department of Health stated: “The proportion of single rooms in new hospital developments should aim to be 50% but should not fall below 20% and must be a higher percentage than the facilities they are replacing”<sup>4</sup>. In Ireland, in 2008, the Strategy for the Control of Antimicrobial Resistance in Ireland recommended 100% single rooms for newly built acute hospitals<sup>5</sup>.

## Current provision of single rooms in Scottish hospitals

In 2010, a survey of single room provision was carried out by NHS National Services Scotland, on behalf of the Health Finance Directorate. It surveyed the number of single rooms by NHS board, by specialism and by hospital. The proportion of single rooms ranged from 25% (Fife, Greater Glasgow and Clyde, Orkney, Shetland) to 44% (Borders). The overall Scottish proportion was 31%. In 2006, the overall proportion was 27%. These figures encompassed single rooms with and without en suite facilities (G O'Brien, Research Manager, Health Facilities Scotland. Personal Communication, 9 June 2016). The 2016 Scottish Inpatient Patient Experience Survey<sup>6</sup> surveyed a random sample of patients who had had an overnight stay in hospital between April and September 2015. From a 40% response to the postal survey, the experiences of 17,767 patients were recorded. Two out of five patients (41%) had had a single room at some point during their most recent hospital stay.

## Health technology description

The Scottish Government define a single room as: “A room with space for one patient which normally contains at a minimum a bed, locker, clinical wash-hand basin and also sanitary facilities comprising a toilet, shower and wash-hand basin”<sup>3</sup>.

With the exception of the Scottish Government paper, the literature we reviewed did not define single rooms.

## Clinical effectiveness

Two systematic reviews were identified, one from 2007<sup>7</sup> and one published in 2010<sup>8</sup>. A relevant literature review<sup>9</sup> was identified during the final editing stages of this evidence note. This review was commissioned by the SG to update the literature review that partially underlies the single room policy. It had a similar review question to this evidence note but without limitation by clinical setting. The findings were consistent with this evidence note.

The first systematic review<sup>7</sup> examined the patient benefits of single rooms on privacy and dignity, patient satisfaction with care, noise and quality of sleep, hospital infection rates, recovery rates, and patient safety issues. The review was of poor methodological quality and was based on 26 studies. The quality of the included studies was not well addressed in the analysis and most studies were not relevant to this evidence note as they were outwith the scope of our clinical areas of interest. There was no cost-effectiveness evidence reported.

The authors reported that the effect of single rooms was rarely studied as a separate topic. There were very few controlled trials and outcome measures were not systematically investigated. They concluded that: "Too few sound studies were found to evaluate the effects of single patient rooms thoroughly".

The 2010 systematic review<sup>8</sup> was well conducted. It encompassed 28 studies carried out between 1981–2006 (two of which were included in the 2007 review<sup>7</sup>). The authors noted that evidence was available for the outcomes of infection rates, patient satisfaction and costs, while length of stay and medication errors were reported less commonly. The authors noted variation in the effects of single rooms on the outcomes and that the methodological quality of included studies was mixed. They also noted that two thirds of the studies were not UK based. Six of the studies were non-analytic opinion based, whilst the remainder were: non-randomised controlled trials, case control studies, cohort studies, controlled before and after studies, interrupted time series studies, correlation studies or audits. Many of the studies

included in this review were not relevant as they were outwith the scope of this evidence note due to clinical context; we excluded critical care, maternity, acute mental health, infectious diseases and paediatrics. Results from studies of infection rates (discussed further in the safety section) and patient satisfaction were mixed. Length of stay was reported to be greater in single bed rooms for surgical patients and medication errors were perceived to be made more frequently in double-occupancy rooms compared with single rooms. There was limited cost information available to the authors. The authors comment that it is hard to establish whether the effects are due to room design or to confounding factors.

## Primary studies

Many of the studies included in the reviews above were not UK based and, therefore, may not be generalisable. An additional search carried out for studies published after 2006 identified six UK studies (from a total of nine identified studies). The design of wards with single rooms is a complex intervention. The studies identified in this additional search consisted of different groups of patients, different designs of single rooms, different comparators and multiple outcomes. In addition, any move to a new hospital includes confounding factors such as new ventilation systems. Studies are summarised in terms of patient satisfaction, staff outcomes and evaluation of change to single room design.

## Patient satisfaction

There are a number of studies which have looked at patient satisfaction. There was variation in the population, methods of study and outcomes. In many studies, patient preference favoured single rooms, although there was variation by patient characteristics such as age and illness severity and according to previous inpatient experience. This makes it difficult to reach a robust conclusion. Studies are summarised in table 1.

Table 1 Studies reporting on patient satisfaction and patient experience outcomes

Country, year	Study type/ setting	Results
Scotland, 2016 <sup>6</sup>	National postal survey of adult patients who had an overnight stay in hospital (n=17,767). Large, well-conducted survey on a random sample.	Patients in a single room were more likely to be happy with their room (91% vs 75%). Those in a single room were less likely to be bothered by noise at night from other patients (22% vs 33%).
Scotland, 2015 <sup>10</sup>	Survey at two points in time (pre and post move to 87% single bed rooms) in a geriatric medicine assessment and rehabilitation hospital (n=43 in 2008, n=46 in 2013). Limited methods reported.	37% in 2008 preferred single rooms, 85% in 2013 preferred single rooms.
Scotland, 2014 <sup>11</sup>	Audit of preferences of inpatients (n=254: 50 in single rooms and 204 in shared accommodation), outpatients (n=100) and medical students (n=94) (conference abstract)	49% preferred single rooms, 37% preferred shared wards and 14% had no preference. Age was a major factor, with older people preferring shared rooms and younger people preferring single rooms.
Scotland, 2014 <sup>12</sup>	Interviewer assisted questionnaire of elderly inpatients (n=70) and visitors (n=63) (conference abstract)	Patients: 29% preferred single rooms, 64% preferred multi-bedded bays and 7% had no preference. Visitors: 79% preferred single rooms, 21% preferred multi-bedded bays.
Sweden, 2012 <sup>13</sup> & 2014 <sup>14</sup>	2012 study: Interviews with 16 patients in multi-bedded rooms within surgical and orthopaedic wards and two focus groups with nurses (n=12). 2014 study: Interviews with patients from surgical ward in single rooms (n=16). These studies were small but well conducted	Qualitative analysis revealed themes of privacy, security, and isolation. Both patients and nurses described advantages and disadvantages of multi-bedded rooms.
Scotland, 2009 <sup>15</sup>	Questionnaire of surgical and medical inpatients (n=80, median age = 64 years). A brief and validated questionnaire.	70% in shared accommodation and 40% in single rooms would prefer shared ward in a future admission. Those preferring shared were older and had had a longer hospital stay.
United States (US), 2009 <sup>16</sup>	Survey of veterans (n=162) (conference abstract).	Overall preference for single rooms (79%) largely for reasons of privacy. The majority of those who shared rooms enjoyed conversation (59%) and 35% reported receiving help from room-mates.
United Kingdom (UK), 2008 <sup>17</sup>	Semi-structured interviews with patients with advanced cancer (n=12). A small but well-conducted study.	The majority of patients expressed a strong preference for multi-bed rooms when they were well enough to interact and single rooms when they were very ill or dying.

## Staff outcomes

A 2008 Dutch study<sup>18</sup> analysed 32 encounters between physician and patient in single rooms (n=11) compared with those in multi-bedded rooms (n=21). Single rooms were associated with longer time with the patient, more questions from the patient and more frequent empathic reactions from the physician.

## Evaluation of change from a traditional design to single rooms design

We identified some recent, mainly UK, studies which evaluated the outcomes of patients in wards with 100% single rooms, compared with conventional wards.

West *et al.* 2010<sup>8</sup>, conducted an evaluation of patients moving from conventional wards to a ward with 24 single rooms in an English hospital (Hillingdon Hospital NHS Trust). Comparisons were either before and after or with patients in a different ward with a different set of clinical conditions. Outcomes included falls, infection rates, patient and staff satisfaction and resource impact. Falls and infection rates are discussed in the safety section. Questionnaires examined a number of issues and revealed that patients in single rooms (n=204) were broadly more satisfied than those in multi-bedded wards (n=176 patients). However, most responses tended to be in the satisfied or very satisfied categories. This was a non-randomised comparative study and results should be treated with caution. Twenty-three staff were asked about 16 aspects of care in single and multi-bedded rooms. Staff rated single rooms as preferable on the majority of 16 aspects of care, except for ease of patient monitoring, minimising risk of falls, managing patients, safety of ward staff and social contact with other patients. There was no evidence that single rooms led to a shorter stay. The authors concluded that single rooms may not raise nursing costs, but would increase cleaning costs and there was no evidence that medication costs are altered by a move to single rooms. Any conclusions should be considered with caution as the patient group chosen to move to the single room wards was not selected randomly but was chosen on the basis of clinical and management reasons.

A 2015 well-conducted and detailed National Institute for Health Research (NIHR) evaluation<sup>19</sup>

of a relocation from an English hospital with mainly open wards to an all single room acute care newly built hospital (Tunbridge Wells) examined the impact on staff and patient experience, care delivery, patient safety and costs.

A mixed methods approach was used, including: 21 stakeholder interviews, 250 hours of observation, 24 staff interviews, 32 patient interviews, a staff survey (n=55), staff pedometer data (n=56) in four case study wards, use of routinely collected data in control hospitals and examination of costs associated with hospital design. Conclusions included; a staff preference for a mix of single rooms and bays, a patient preference for single rooms (although some reported feelings of isolation), no strong evidence of single rooms affecting patient safety and higher housekeeping and cleaning costs for single rooms.

In addition to this evaluation, an audit and a survey were undertaken following this hospital relocation and were published as conference abstracts. An audit<sup>20</sup> of clinical deterioration in patients showed there was no change in recognition of unwell patients following the move to single rooms. The authors commented that the greater number of nurses may have contributed to the finding. A postal survey<sup>21</sup> of 700 discharged medical patients was carried out on their experience of dignity. Thematic analysis outlined positive and negative experiences of single rooms.

## Safety

One quasi-experimental study was identified<sup>19</sup>. This examined adverse events and healthcare associated infections (HAIs). In addition, an audit published as a conference abstract is included for information.

The quasi-experimental study was a well-conducted, before-and-after study with non-equivalent controls, carried out over a 36 month period. It was part of the 2015 evaluation of a newly built hospital with 100% single rooms (Tunbridge Wells, described in clinical effectiveness section)<sup>19</sup> and looked at the outcomes of falls, pressure ulcers, medication errors and HAI using routine data sources. Matched control hospitals comprised a new build hospital with mixed accommodation (single and multi-bed wards) and a traditional hospital.

This allowed the authors to determine whether the move to a modern building or single rooms *per se*, influenced any change. The results were equivocal; any changes in the outcome measures reported following the move to single rooms had plausible alternative explanations.

A retrospective audit<sup>22</sup> of a move to a general hospital in Wales with all single rooms found a significant increase in falls, a significant reduction in *Clostridium difficile* infection (CDI) and no significant differences in episodes of protection of vulnerable adults. This was published as a conference abstract and results should be treated with caution as we were unable to appraise study methodology.

### Falls

An evaluation of a move to a single bed ward looked at the outcome of falls<sup>8</sup> (described in clinical effectiveness section). In addition, there were two audits on the effect of single rooms on falls.

The evaluation<sup>8</sup> used before and after (relocation to single bed wards) data and recorded 24 falls in the multi-bedded wards, over a 12 month period, compared with 33 in the single bed wards over a 10 month study period. The incident reports for 10 of the single bed falls could not be reviewed and, due to the small number of incidents, no conclusions were reached.

A 2015 UK retrospective audit<sup>23</sup> over 18 months of inpatient falls in units with 100% single rooms compared with multi-bedded rooms, showed a significantly increased fall and fracture rate with single rooms. However, this was a retrospective observational study with potential confounding factors contributing to the finding and so conclusions should be treated cautiously. In contrast, a small, retrospective audit<sup>24</sup> of falls in a US sample of elderly inpatients in either single or non-single rooms found no statistically significant difference in number of falls or of HAIs between single and non-single rooms, although the study was limited by a low number of events.

### Healthcare associated infections (HAI)

Much of the literature on infection and hospitals related to isolation of patients entering hospital. There was a lack of evidence on the effects of single room design compared with multi-bedded rooms on HAI rates. Two systematic reviews<sup>7,8</sup>

(described in the clinical effectiveness section) which included infection rates as an outcome, an evaluation of a move to a single bed ward which looked at the outcome of infection rates<sup>8</sup> (described in the clinical effectiveness section) and a retrospective audit<sup>25</sup> (published as a letter) were identified. In addition, searches identified a relevant systematic review which is due for publication in early 2017<sup>26</sup>.

A 2007 systematic review<sup>7</sup> reported one relevant review which concluded that there was a lack of evidence to link hospital design with infection prevention. However, the systematic review did not report the quality of this included review and so conclusions should be treated with caution.

A 2010 well-conducted systematic review<sup>8</sup> reported mixed results from the relevant included studies (only four of the included studies met our inclusion/exclusion criteria). One medium quality study reported no significant differences in infection rates between single rooms and non-single rooms; this was a prospective, before and after study which looked at infection rates following a move to a new hospital with all single rooms. However, there were limitations in methodology and results should be treated with caution. A low quality study showed single rooms to be associated with higher rates of infection. Two well-conducted qualitative studies reported that nurses perceived infection rates to be higher in double-occupancy rooms, compared with single rooms.

The evaluation<sup>8</sup> (described in the clinical effectiveness section) used before and after relocation to single bed ward data over a 10 month period and reported that the evidence for single rooms and infection rates “did not suggest a large fall”.

A Dutch retrospective audit<sup>25</sup> on the incidence of nosocomial CDI pre and post move to 100% single rooms was identified. The move resulted in a significant drop in the incidence of CDI. This was published as a letter and so conclusions should be treated with caution.

A Dutch systematic review and meta-analysis<sup>26</sup> on whether single rooms prevent the transmission of micro-organisms in inpatients in hospital is due for publication in early 2017. The primary outcome will be number of infections in patients. The author was unable to share any information ahead of publication.

## Cost effectiveness

No relevant cost-effectiveness studies were identified.

## Conclusion

This rapid review of the published literature identified two systematic reviews<sup>7,8</sup>. There was variability in the quality of the included studies and in the effect of single rooms on the outcomes. Authors commented on the difficulty in establishing whether any effects reported in the literature were due to room design or to confounding factors.

A search of the primary literature identified nine studies (six UK) as well as two evaluations of a change from traditional wards to 100% single rooms. These primary studies and evaluations investigated the effects of single rooms on patient and staff satisfaction, falls and HAIs, as well as evaluating the move to single room hospitals on multiple outcomes.

Examining all evidence together, it indicated that patients tended to prefer single rooms, although it is not clear if this is generalisable to different settings or groups of patients. One study reported staff had a preference for single rooms for most aspects of care. Another study showed a staff preference for a mix of single rooms and bays.

Data on falls and HAIs were limited and no conclusions could be drawn. A well conducted evaluation reported no substantial changes in infection rate following a move to a single bedded ward, while two qualitative studies suggested that nurses and administrative staff perceived infection rates to be higher in double occupancy rooms compared with single rooms.

Due to the nature of the intervention, studies often did not have control groups and so results should be interpreted with caution. It was not possible to draw overall conclusions on the benefits/risks of single rooms from the studies due to the variation in populations investigated, designs of specific wards, outcomes and scope of the research projects.

Overall, evidence is limited in quantity and quality and it is not possible to draw conclusions from the disparate findings.

## Identified research gaps

Further research is required to determine the effects of single rooms on safety outcomes and the characteristics of patients who will most likely benefit from single rooms. This type of question: what works, for whom and in what circumstances, is best addressed using evaluation.

## Equality and diversity

Healthcare Improvement Scotland is committed to equality and diversity in respect of the nine equality groups defined by age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion, sex, and sexual orientation.

The process for producing evidence notes has been assessed and no adverse impact across any of these groups is expected. The completed equality and diversity checklist is available on [www.healthcareimprovementscotland.org](http://www.healthcareimprovementscotland.org)

## About evidence notes

This evidence note will be considered for review 2 years post-publication, and at 2-yearly intervals thereafter. For further information about the evidence note process see [http://www.healthcareimprovementscotland.org/our\\_work/clinical\\_\\_cost\\_effectiveness/shtg/standard\\_operating\\_procedures.aspx](http://www.healthcareimprovementscotland.org/our_work/clinical__cost_effectiveness/shtg/standard_operating_procedures.aspx)

To propose a topic for an evidence note, email [evidencenotes.HCIS@nhs.net](mailto:evidencenotes.HCIS@nhs.net)

References can be accessed via the internet (where addresses are provided), via the NHS Knowledge Network <http://www.knowledge.scot.nhs.uk>, or by contacting your local library and information service.

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Declarations of interest were sought from all peer reviewers. All contributions from peer reviewers were considered by the group. However the peer reviewers had no role in authorship or editorial control and the views expressed are those of Healthcare Improvement Scotland.

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