

A Strategy for the Control of
Antimicrobial Resistance in Ireland



Health Protection Surveillance Centre
Lárionad Faire um Chosaint Sláinte



Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Surveillance of MRSA in General Intensive Care Units

First Annual Report 2008

August 2009

Acknowledgements

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Summary

- This report represents the first annual report of the National meticillin-resistant *Staphylococcus aureus* (MRSA) in ICU Prevalence Surveillance Study (1st April to 31st December 2008 inclusive). The project is being carried out without the allocation of additional resources locally and reflects the desire and enthusiasm of healthcare professionals to share data publically that is scientifically collected and analysed.
- MRSA figures in this report refer mostly to MRSA colonisation in general intensive care units (ICUs). No direct information on MRSA infection was collected.
- Thirty-two hospital ICUs participated. These are stratified by;
 - (i) ICU type: 18 level 2/3 ICUs (such ICUs contain both ICU and high dependency unit patients) and 14 level 3 ICUs (ICU patients only)
 - (ii) The percentage of patients requiring mechanical ventilation: 11 in the low ventilated group (0-29% of patients ventilated), 11 in the medium ventilated group (30-59% of patients ventilated) and 10 in the high ventilated group (60-100% of patients ventilated)See section 2.1 for definitions and further explanation.
- ICU bed occupancy and isolation room occupancy rates are high in both the level 2/3 (88% and 75%, respectively) and level 3 ICU groups (90% and 90%, respectively).
- There are large differences in isolation room resources; four of the ICUs do not have any isolation rooms. While the majority of isolation rooms are equipped with hand sinks (98%), only 20% have anterooms.
- Only two of the ICUs could successfully isolate all of their MRSA patients when surveyed.
- There is a large difference in the level of acuity of patients within and between each ICU group. In the level 3 group, 39% to 81.2% of patients needed ventilation and in level 2/3 ICUs the proportion was 2.5% to 77%. This highlights the inappropriateness of directly comparing ICUs.
- There was a positive correlation between MRSA prevalence and the proportion of patients requiring ventilation. Use of mechanical ventilation is an indicator of patient acuity.
- All ICUs screen for MRSA colonisation on admission to ICU. However, there are differences in screening protocols between hospitals, precluding direct comparisons of MRSA rates.
- The weekly proportion of ICU-acquired MRSA varies nationally from 0 to 3.3% with 84% of ICUs showing a proportion of <1.5%. Therefore figures on MRSA acquisition are low in the majority of general ICUs.
- The aim of this surveillance project is to provide some estimate of MRSA prevalence and acquisition in general ICUs in Ireland within the limited resources available locally and nationally for surveillance. Since ICUs vary considerably in case mix, size and the provision of isolation rooms, direct comparisons between ICUs are inappropriate.

1.0 Introduction

The primary objective of the meticillin-resistant *Staphylococcus aureus* (MRSA) in intensive care units (ICU) prevalence study is to develop a simple surveillance protocol for monitoring MRSA in Irish ICUs. The surveillance program is designed so that the burden of collecting data for participants is kept to a minimum. The project is currently overseen by the MRSA in ICU steering committee (Appendix A).

The surveillance protocol was piloted from June 2007 to March 2008. During the nine-month pilot period (Q3 & Q4 2007, Q1 2008), several amendments were made to the protocol following valuable ICU feedback, and the number of participating ICUs increased. Following each quarter, a report was circulated to participants to provide an overview of each hospital's data and to allow comparison with data gathered from the national set.

At the end of the pilot period, 31 hospitals (8 regional/tertiary, 20 general, 1 specialist and 2 private hospitals) were providing weekly MRSA surveillance data. A report documenting the initial findings of the pilot period was published in April 2008 (1).

The main findings outlined in the pilot report were as follows:

- ICUs varied considerably in acuity, size, infection prevention and control resources and MRSA screening policies.
- During the course of the pilot study, three hospitals changed their policy to routinely screen all patients for MRSA upon admission to the ICU so that by the end of the pilot study 100% (31/31) of participating hospitals routinely screened all patients.
- An overview of isolation room facilities within ICUs was carried out. The majority of rooms lacked essential features such as an anteroom and/or desirable features such as negative/positive pressure options. Rooms which did have these specifications were more often found in ICUs within regional/tertiary hospitals than in general hospitals. It was therefore decided for the purpose of this study to classify all single rooms used for isolating patients as 'isolation rooms', irrespective of the presence/absence of specific facilities. The average ratio of isolation rooms to available beds is 1:5 for general hospitals and 1:3 for regional/tertiary hospitals.

Subsequent to the pilot report, several amendments and updates to the protocol were introduced. The finalised protocol (version 8) is currently employed by participants (2).

This report represents the first annual report of the national surveillance dataset since completion of the pilot phase. The data collection period includes submissions from 1st April to 31st December 2008 inclusive and represents data from 32 acute Irish hospitals (an additional hospital joined the project after the pilot study).

2.0 Methods

The methodology for submitting data is outlined in version 8 of the protocol (2). In brief, participants collect data weekly and submit it to the Health Protection Surveillance Centre (HPSC) monthly. The HPSC collate this data and provide feedback both individually to participating hospitals (quarterly) and nationally. This report for 2008 represents the first annual report.

2.1 Definitions used

ICU type

- A 'level 2/3 ICU' unit contains a combination of true ICU patients (i.e., level 3 patients) and coronary care unit (CCU) or high dependency unit (HDU) patients, (i.e., level 2 patients or a variable combination of these groups).
- A 'level 3 ICU' contains only patients classified as ICU patients and excludes those from CCUs and HDUs.

Hospital category

- 'Regional/tertiary' hospital refers to a large hospital, which accepts transfers from other hospitals such as county hospitals.
- A 'General' hospital refers to a smaller hospital such as a county hospital.

ICU Ventilation level

- 'Low ventilated ICU group': 0-29% of patients ventilated, (n=11)
- 'Medium ventilated ICU group': 30-59% of patients ventilated, (n=11)
- 'High ventilated ICU group': 60-100% of patients ventilated, (n=10)

2.2 Baseline information (Appendix B):

Baseline information is submitted by participants on an annual basis. This is designed to give background information not only on the hospital, but also the ICU type, available facilities and the organisational aspect of ICU care in place.

2.3 Weekly census form (Appendix C):

A weekly census form is completed by participants and captures information on a single day of the week only. For consistency, participants complete the census on the same day each week.

2.4 Caveats

The data presented in this report need to be interpreted bearing the following caveats in mind:

Point prevalence study

- As this is a point prevalence study, not all cases of MRSA colonisation and infection within the ICU each week are reported. Each week a proportion is calculated to reflect a snapshot in time and then this is averaged over a longer time period (i.e., quarterly and yearly). Only confirmed results are recorded on the weekly census.
- The rules that apply to a point prevalence survey have not been applied to calculate the weekly proportion of ICU-acquired MRSA, to better capture a sense of the problem of MRSA transmission in ICUs. For this analysis, it was decided that each week only new acquisitions of ICU-acquired MRSA that occurred during that week were captured and those patients who acquired MRSA during the week still had to be present within the ICU on the day the census was

taken in order to be included in the survey. The figures do not reflect data collected on all patients within the ICU over the three quarter period. It is only a snapshot of the ICU at one point in time each week. This analysis provides a crude estimate of the problem of MRSA transmission in ICUs. It is by no means a definitive rate.

Differences between hospitals

- Due to the large variability in ICUs in acuity, size and the provision of infection prevention and control resources, it is inappropriate to make direct comparisons between ICUs. Hospitals with more 'at-risk' specialities are likely to experience a higher rate of MRSA colonisation /infection than hospitals with more 'low-risk' specialities. Hospitals should ideally be stratified into common cohort groups to allow comparison of ICU performance. However, the requirement for hospitals to assess how they compare according to different parameters with other ICUs was requested by the HSE. In the absence of a robust measure of patient acuity (e.g., APACHE score), the addition of the proportion (%) of 'ventilated patients' was included in the survey in an effort to provide a crude indication of illness burden within the ICU. Stratification of results by ICU type was also included to account for general ICUs that cater for mixed categories of patients i.e., high dependency and coronary care patients. In this report hospitals may compare their ICU to others of a similar grouping but it should be stressed that any comparisons are crude.
- Differences between hospital laboratory screening methodologies are another reason to avoid inter-hospital comparisons. Different hospitals may be using screening methodologies with different levels of sensitivity which will in turn have an impact on a hospital's MRSA prevalence.
- In this study the definition of an isolation room is a basic single room that does not necessarily have additional infection prevention and control features such as an anteroom and negative pressure ventilation. There are differences between hospitals in the number and quality of isolation rooms. Therefore hospitals have varying capacities to effectively isolate patients appropriately to reduce the spread of MRSA.

Small numbers

- The data presented in this report are based on results collected over a nine month period. The number of MRSA cases reported may therefore be low, particularly for smaller hospitals and small differences in the numerator or denominator may dramatically affect the rates calculated. It is therefore not recommended to make comparisons between hospitals.

2.5 Hospital activity data

Data on bed days used was provided by the HSE Performance Monitoring Unit (PMU) and represents hospital activity data from 2008. These data are based on the average number of available acute in-patient beds during 2008, and not on the total bed capacity of a hospital. It does not include long-stay or day case (including dialysis) bed use, but does include acute psychiatric bed use (where the latter are included in the bed compliment of an acute hospital).

2.6 Analyses and stratification of data

Several analyses are carried out to reflect the problem of MRSA in general ICUs. For each analysis, weekly prevalence data are first calculated and then averaged quarterly and annually (Q2-Q4, 2008) to estimate the overall ICU prevalence. Only weeks where data was provided are included in calculating the averages. All analyses calculated in the annual report are listed in Table 1 below.

For certain analyses, ICUs are stratified by ICU type and the percentage of patients ventilated. For ICU type, ICUs are grouped into 'level 2/3' and 'level 3' ICUs. See section 2.1 for definitions. The majority of regional/tertiary hospitals (89%) have level 3 ICUs with 76% of general hospitals containing level 2/3 ICUs.

A crude measure of ICU acuity is estimated through collecting information on the percentage of patients within the ICU that have invasive mechanical ventilation. ICUs are evenly grouped into low, medium and high ventilated groups. See section 2.1 for definitions of ventilated groups. The data shows that 91% of the ICUs in the low ventilated group are level 2/3 ICUs and 70% of those in the high ventilated group are level 3 ICUs. However, this stratification of ICUs is only based on surveillance data collected over a three quarter period. Data collected over a longer period of time would be required to more accurately stratify ICUs according to the percentages of patients that are ventilated.

Table 1. Weekly calculations within the report and the associated figures

Measure	Calculation	Associated with Results section
<i>Weekly Bed Occupancy (%)</i>	<i>(Beds occupied / Beds available) x 100</i>	3.2.1
<i>Weekly Isolation Room Occupancy (%)</i>	<i>(Number of patients in isolation rooms / Number of isolation rooms available) x 100</i>	3.2.1
<i>Weekly MRSA Prevalence</i>	<i>(Number of patients with MRSA / Number of beds occupied) x 100</i>	3.2.2
<i>Weekly proportion of ICU-acquired MRSA</i>	<i>(Number of patients with MRSA newly acquired in the ICU that week / Number of beds occupied) x 100</i>	3.2.3
<i>Weekly % Patients Ventilated</i>	<i>(Number of Patients Ventilated / Number of beds occupied) x 100</i>	3.2.4
<i>Weekly % MRSA Patients in Isolation</i>	<i>(Number of MRSA patients in isolation / Number of patients with MRSA) x 100</i>	3.2.5

3. Results

3.1 Analysis of baseline data

3.1.1 Participating ICUs - demographics

Data from 32 ICUs are reviewed in this report. Hospital categories are listed in table 2. Definitions of ICU type (i.e., level 2/3 and level 3 ICUs) and hospital category are provided in section 2.1.

Table 2: Participating hospitals by category, hospital bed capacity and type

Hospital Category	Hospital bed capacity	Level 2/3 ICU	Level 3 ICU	Total
General	<150	3	0	3
	150-300	7	4	11
	300-450	5	1	6
Private	<150	1	0	1
	300-450	1	0	1
Regional/Tertiary	>450	0	8	8
	300-450	1	0	1
Specialist	<150	0	1	1
Total		18	14	32

3.1.2 MRSA screening protocol

All participants screen for MRSA on admission to ICU. However, there are differences in the screening approaches used within different ICUs after admission as follows:

- 100% (n=32) of ICUs complete follow up screens on a weekly basis
- Patient sites routinely screened are as follows:
 - 94% (n = 30) of hospitals provided information on patient screening sites:
 - 43.7% (n = 14) of hospitals screen the nasal, groin, wound and medical device sites as recommended by the 2005 SARI MRSA guidelines (3).
 - 87.5% (n = 28) screen nasal and groin sites only.
 - 94% (n = 30) perform nasal screening only.
 - 6% (n = 2) of ICUs provided no information.

3.1.3 Designated consultant posts in intensive care medicine

Throughout the Republic of Ireland, there are currently only two Consultant in Intensive Care Medicine posts, both of which are based full-time in the Mater Hospital. The second of these posts was recently approved in March 2009. Table 3 lists the hospitals which have Consultant Anaesthetists with a designated special interest in intensive care medicine. There are 20 such posts in the country covering 14 hospitals.

Table 3. Designated consultant anaesthetists with a special interest in intensive care medicine

Hospital name	Number of posts
St James's Hospital	3
Adelaide and Meath Hospital, Dublin incorporating the National Children's Hospital	1
St Vincent's University Hospital/St. Michael's	3
Connolly Hospital, Blanchardstown	1
Beaumont Hospital	2
Our Lady of Lourdes Hospital, Drogheda	1
South Tipperary General Hospital, Clonmel	1
Cork University Hospital/UCC	2
St Luke's General Hospital, Kilkenny	1
University College Hospital Galway	2
Mid-Western Regional Hospital, Dooradoyle	2
Portiuncula / Roscommon	1

3.1.3 Isolation room facilities

Four of the participating ICUs **do not have any** isolation rooms. Of the remaining 28 ICUs, there are a total of 61 isolation rooms ranging from 1 to 6 per ICU. Table 4 outlines the numbers of isolation rooms available according to ICU type. While the majority (62%, n=38) of isolation rooms are found within level 3 ICUs, 76% of these are in hospitals with a bed capacity of >450 (Table 4). Seventy-one percent of ICUs with isolation rooms have one to two isolation rooms. All ICUs with five or more isolation rooms are level 3 ICUs with a hospital bed capacity of >450.

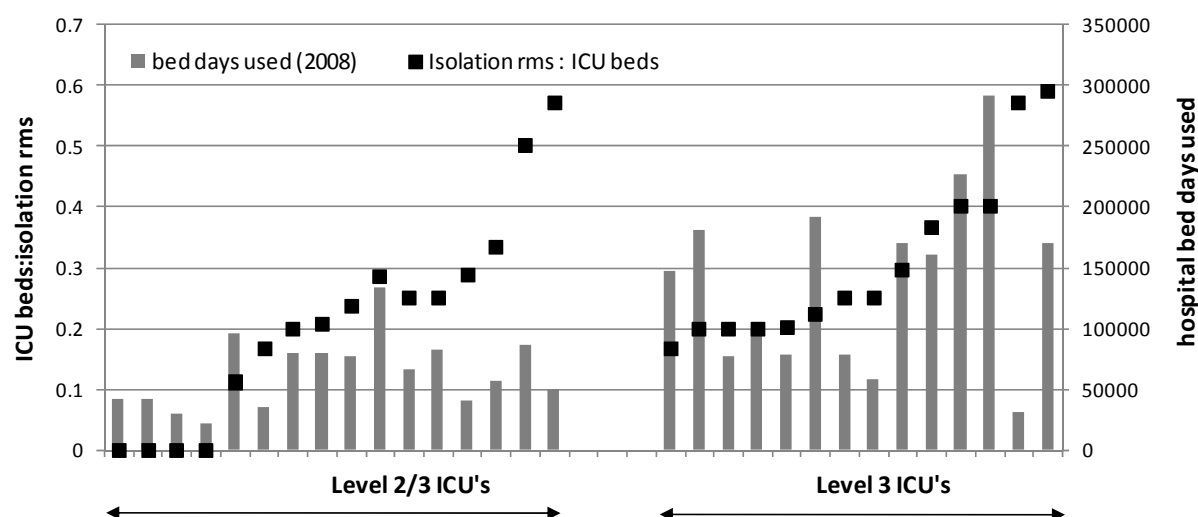
Table 4: Number of isolation rooms by hospital bed capacity and ICU category

ICU type	Number of isolation rooms	Hospital bed capacity			
		<150	151-300	301-450	>450
Level 2/3 (n=23)	0	3	1		
	1		4	5	
	2	1	1	1	
	4		1	1	
	1		4	1	1
Level 3 (n=38)	2				2
	3				1
	4	1			1
	5				1
	6				2

ICU isolation room resources in relation to hospital activity

There is considerable variation in ICU isolation room resources between hospitals that is not necessarily related to hospital activity. Figure 1 plots the average bed days used for each hospital associated with a participating ICU, to give an indication of the acute hospital activity (grey bar). Overlaid is the ratio of isolation rooms to ICU size for each hospital (black dot). As expected, level 3 ICUs have a higher acute hospital activity when compared to the level 2/3 ICU group. However, for both groups there is a large variation in ICU isolation room resources among hospitals with similar hospital activity. Twenty two percent (n=4) of level 2/3 ICUs have no isolation rooms.

Figure 1. Overview of hospital activity to isolation room resources within the general ICU of acute public hospitals



Breakdown of isolation room facilities

The range of facilities available in the 56 isolation rooms are shown in table 5. While 98% of isolation rooms have a hand sink (55/56), only 20% (11/56) are equipped with anterooms. No data was provided for five isolation rooms.

Table 5: Number of isolation rooms and their available facilities

Facilities available	# of rooms	% of total
Presence of a hand sink	55	98
Anteroom	11	20
Negative pressure	21	38
Positive pressure	15	27

3.2 Analysis of surveillance data

3.2.1 ICU bed and isolation room occupancy

Bed occupancy ranged from 70.0% to 97.7% with a median value of 87.7%. The median does not change significantly when ICUs are stratified by ICU type or the proportion of ICU patients requiring ventilation, indicating that all participating ICUs have high bed occupancy.

Isolation rooms may have been used for reasons other than infection prevention and control purposes and therefore occupancy figures represent the overall use of isolation rooms within the ICU. Four ICUs did not have any isolation room facilities. Of the remaining 28 participants, isolation room occupancy rates ranged from 28.9% to 97.9%. Level 3 ICUs have a higher occupancy level (89%) compared to level 2/3 ICUs (73%). In addition, ICUs with more patients ventilated (high level group) have the highest occupancy levels (89%) compared to ICUs with fewer patients ventilated (medium level = 82.5% occupancy, low level = 80% occupancy).

3.2.2 Weekly MRSA prevalence

The mean MRSA prevalence over the three quarters of 2008 ranged from 2.9% to 21.2%, with a median of 7.8%. However, the prevalence varies widely depending on the type of ICU. The level 2/3 ICU group had a median MRSA prevalence of 5.9% with the level 3 group having a higher prevalence, 13% (Fig 2A).

Fig 2B highlights a positive correlation between the prevalence of MRSA and the percentage of patients ventilated (Chi-squared for linear trend analysis, $p = <0.0000001$). ICUs with low numbers of patients ventilated ($< 30\%$ patients ventilated, $n=11$) have a mean MRSA prevalence of 5.8%, whereas ICUs with a medium number (30-59% ventilated, $n=11$) and a high number ($>60\%$ ventilated, $n=10$) of patients ventilated had prevalences of 8.3% and 11.7%, respectively.

NOTE: For each boxplot in the figures that follow, the vertical line connects the 5th percentile and 95th percentile values and the box highlights the middle fifty percent of the data (the interquartile range, IQR). The median is highlighted by a black horizontal bar.

Fig 2A. MRSA prevalence by ICU type

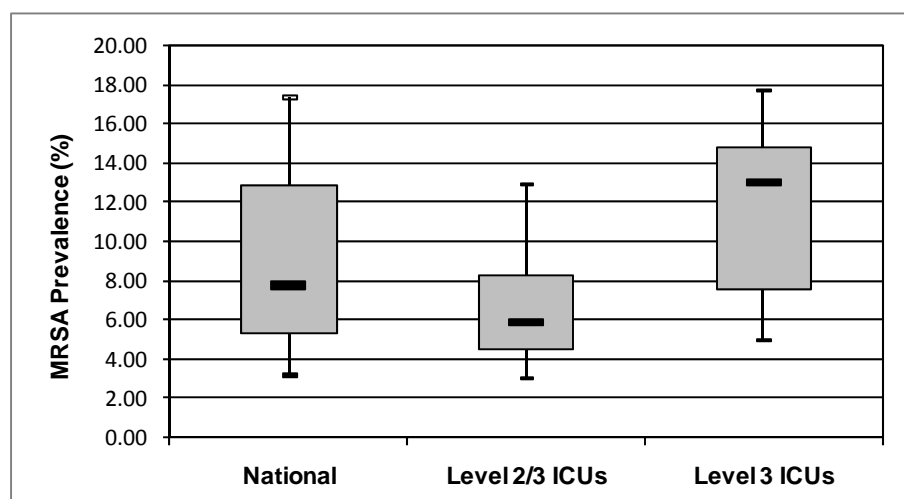
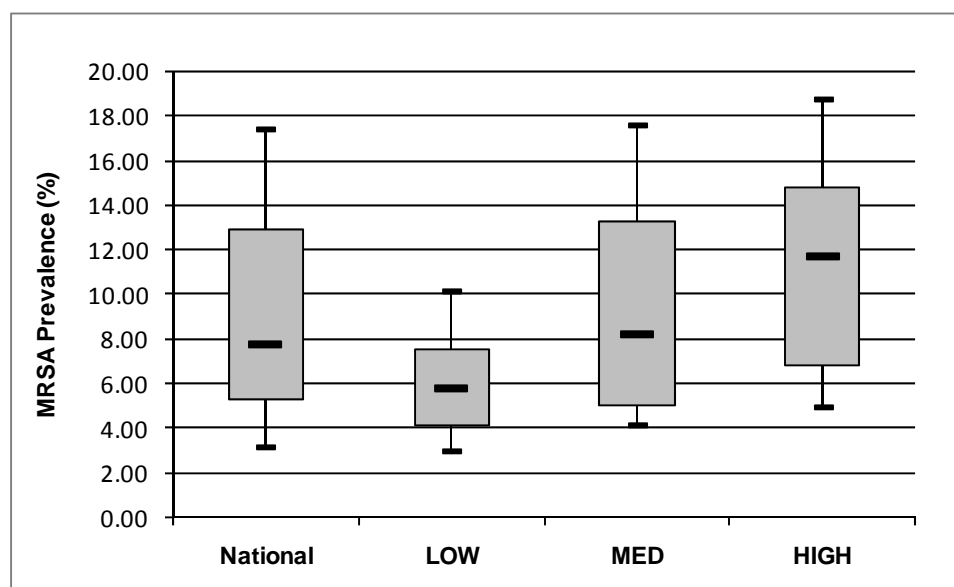


Fig 2B. MRSA prevalence by level of patient ventilation

ICUs are evenly grouped into low (LOW; 0-29% of patients ventilated, n=11), medium (MED; 30-59% of patients ventilated, n=11) and high (HIGH; 60-100% of patients ventilated, n=10) ventilated groups.



3.2.3 Weekly proportion of ICU-acquired MRSA

The weekly proportion of MRSA acquisition within general ICUs varied from 0% to 3.3% depending on the type of ICU. Figure 3A shows the data stratified by ICU type. Level 2/3 ICUs had an average proportion of 0.5% compared to level 3 units with 0.9% yet there is no difference when comparing these two groups (Chi-test analysis, $p=0.3$). On the other hand, in figure 3B, ICUs with a low proportion of patients ventilated (<30% patients) had an average proportion of MRSA acquisition of 0%, which is significantly different compared to the medium and high level ventilated patient ICU groups with 0.83% and 0.73%, respectively (Chi-test analysis, $p = 0.001$).

Fig 3A MRSA acquisition by ICU type

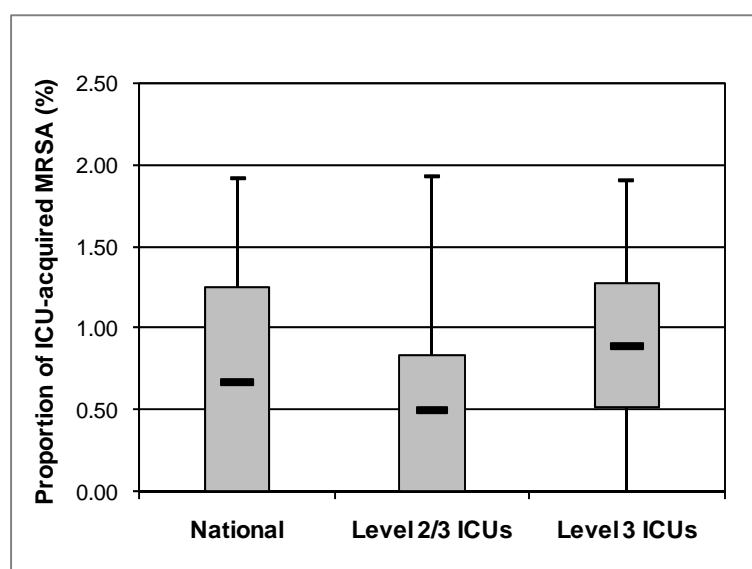
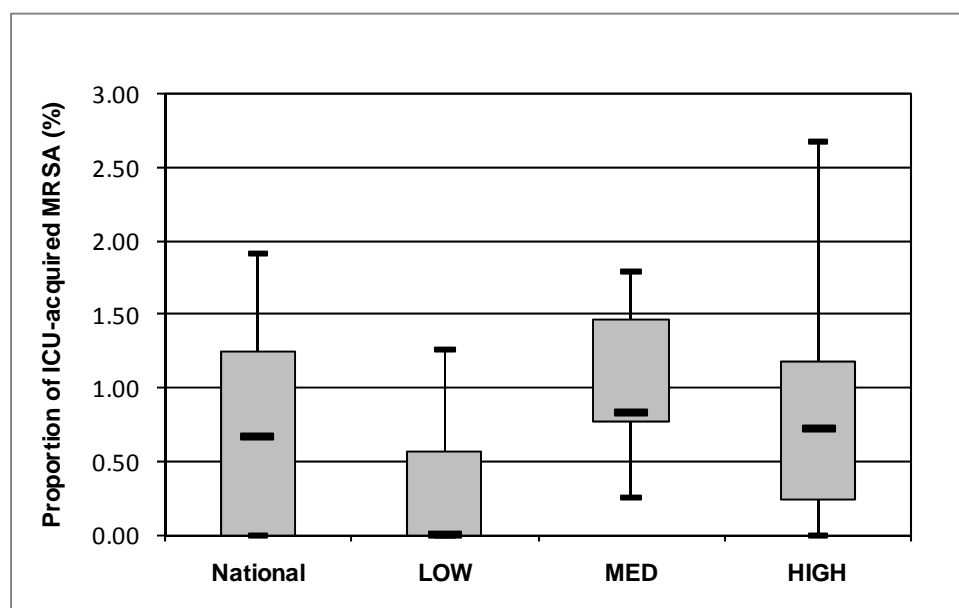


Fig 3B MRSA acquisition by level of patient ventilation

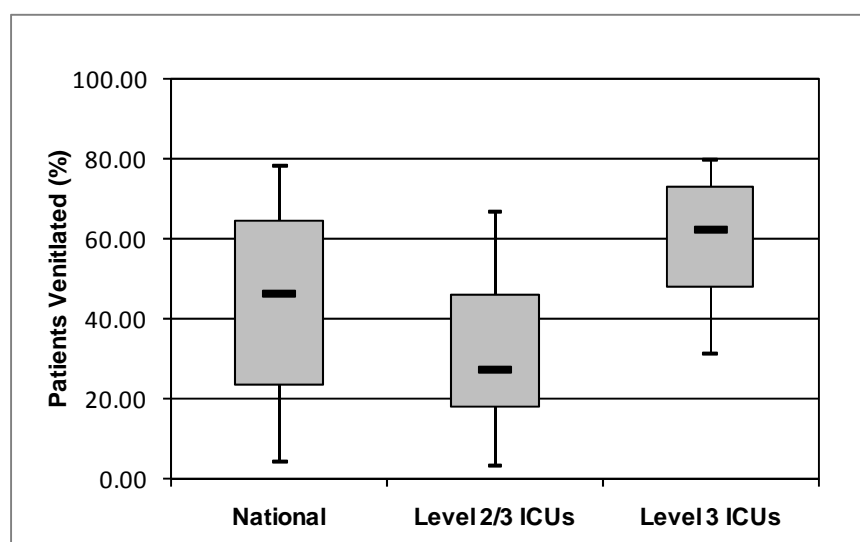
ICUs are evenly grouped into low (LOW; 0-29% of patients ventilated, n=11), medium (MED; 30-59% of patients ventilated, n=11) and high (HIGH; 60-100% of patients ventilated, n=10) ventilated groups.



3.2.4 Differences in numbers of patients ventilated across ICUs

The proportion (%) of patients requiring ventilation varied from 2.5% to 81.2% highlighting the difference in case-mix and the acuity of patients in participating ICUs. This emphasises the need for a more comprehensive stratification of the data to enable meaningful comparisons across ICUs. Regional/tertiary hospitals had a higher percentage of their patients ventilated (median = 73%) compared to general hospitals (median = 36%), (data not shown). Fig 4A shows that level 3 ICUs had a higher proportion of their patients ventilated (median = 62%) compared to level 2/3 ICUs (27%).

Fig 4A Proportion of patients ventilated by ICU type



3.2.5 Percent of MRSA patients (colonised/infected) in isolation

Figure 5A outlines data on the ability of ICUs to isolate MRSA colonised/infected patients over the study period. The overall figure refers only to weeks when MRSA positive patients were in the ICU. On average 76% of MRSA patients were isolated but only two participating ICUs could successfully isolate all their MRSA patients. Level 3 ICUs were capable of isolating 81% of their patients; level 2/3 ICUs isolated 64% of MRSA patients (Fig 5A). ICUs with high numbers of patients ventilated (>60%) isolated on average 90% of MRSA patients compared to medium and low ICUs where the figures were 67% and 63%, respectively (Fig 5B).

Fig 5A Percentage of MRSA patients in isolation room by ICU type

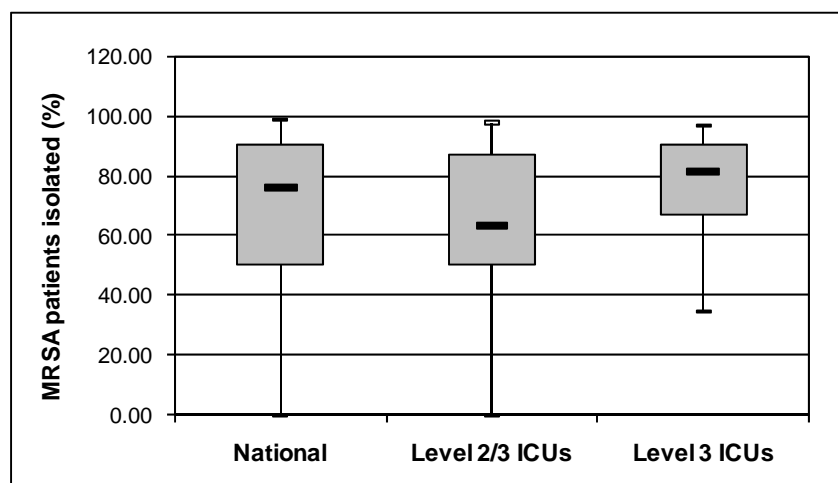
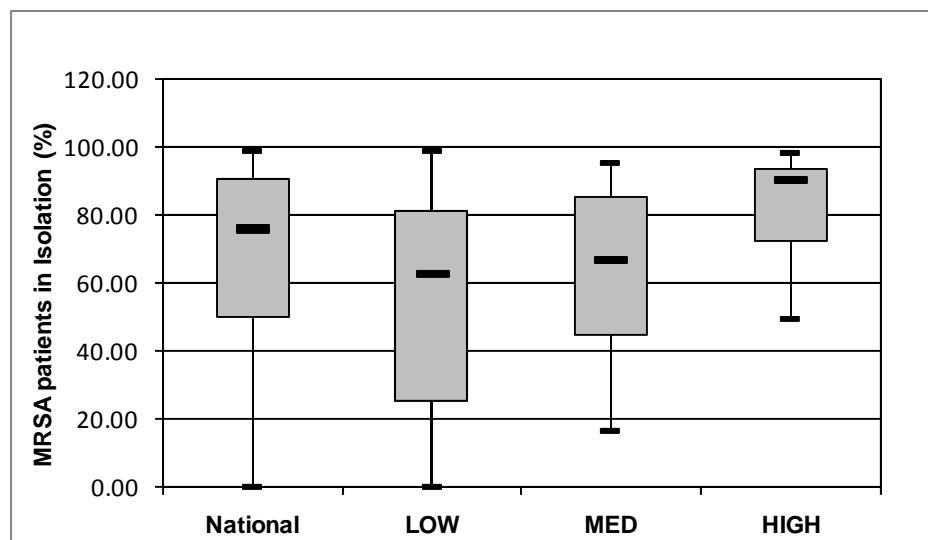


Fig 5B Percentage of MRSA patients isolated according to the proportion of patients requiring ventilation

ICUs are grouped into low (LOW; 0-29% of patients ventilated, n=11), medium (MED; 30-59% of patients ventilated, n=11) and high (HIGH; 60-100% of patients ventilated, n=10) ventilated groups.



4.0 Discussion

The main objective of the MRSA in ICU surveillance project is to provide participants with timely data on MRSA prevalence that can be used locally to monitor trends over time. When reporting the data back to participants, ICUs are provided with a national overview to evaluate where they lie in comparison to the national dataset. It is important to note, that participating ICUs vary considerably in size, acuity, the provision of infection prevention and control resources and the use of different MRSA screening approaches. Since the prevalence and transmission of MRSA increases in high-risk patient groups, ICU data should be stratified by ICU acuity (i.e., APACHE score) to allow robust comparison and avoid misinterpretation of the parameters measured. This type of stratification is not possible with the current protocol as it was designed so that the burden of data collection was kept to a minimum. Additional resources would be required in most ICUs to enable more detailed data collection. For the present, it was agreed to focus on the ease of completion of weekly forms thereby enabling as many ICUs as possible to participate.

A crude measure of an ICU's case-mix was assessed by collecting information on the percentage of patients mechanically ventilated at a point in time. As expected, regional/tertiary hospitals had a higher percentage of ventilated patients (median=73%) compared to general hospitals (median=36%). Similarly, ICUs catering only for level 3 patients had a median of 65% of patients ventilated compared to level 2/3 ICUs with a median of 25%. While a measure of the proportion of patients ventilated within an ICU has allowed a limited degree of ICU stratification, ventilation rates alone are a weak surrogate for severity of illness. Other markers for organ support such as vasoactive drug support and dialysis would allow a more robust stratification of ICUs by ICU acuity.

It is very clear from the data that occupancy levels within general ICUs are consistently high across all ICU types with an overall national average of 88%. However, this is an underestimate of the true occupancy of general ICUs since this project only accounts for patients within the ICU and not those receiving intensive care 'off-site', e.g., in a theatre recovery or hospital ward area, the level of which is substantial.

MRSA prevalence presented in this report reflects mostly patients colonised with MRSA upon admission to the ICU. The proportion of ICU-acquired MRSA was low in the majority of the participating ICUs. As expected, a positive correlation between MRSA prevalence and the level of patient ventilation ($p = <0.0000001$) was shown. Use of mechanical ventilation is one indicator of the acuity of a patient, reflecting that units with more high-risk patients have a higher rate of MRSA prevalence compared to ICUs with lower risk patient groups. This probably reflects the fact that patients in the high risk group had a longer length of stay in a healthcare facility with higher susceptibility to colonisation due to increased contact with healthcare workers. This data should be developed further with the addition of other indicators of patient acuity to further study the relationship between MRSA prevalence and ICU acuity.

The proportion of ICU-acquired MRSA varied nationally from 0 to 3.3%, with 84% of ICUs $< 1.5\%$, i.e., low in the majority of general ICUs in Ireland. There was no significant difference in the acquisition of MRSA between level 2/3 and level 3 ICUs. However, when comparing ICUs by percentage of patients ventilated, the low level group ($<30\%$ ventilated) showed a significantly lower proportion of ICU MRSA acquisition compared to other ICUs with more patients ventilated ($p = 0.001$). The association between intensity of care and risk for MRSA acquisition is well known (4). ICUs with more 'at-risk' patient populations are more prone to higher rates of MRSA acquisition because:

- there is more staff to patient contact
- there is a higher use of medical devices compared to units with less acute patients
- there is more selective pressures induced by antibiotic therapy

In addition, the capacity of an ICU to isolate MRSA patients using single rooms or cohorting will vary and ICUs may differ with respect to the infection prevention and control practices in place, which are not studied as part of this project.

There is a wide variation in isolation room resources across participating ICUs. It is of concern that some ICUs do not have isolation rooms and that in many other ICUs there are either insufficient numbers of rooms and or that these rooms are sub-standard, i.e., they lack a hand basin and or an anteroom. To reduce the significant risk of MRSA cross-infection and subsequent infection, many ICUs need major refurbishment to facilitate patient isolation in accordance with best international practice. Interestingly, only two Irish hospitals could successfully isolate all of their MRSA colonised patients. On average only 76% of MRSA patients were isolated in ICUs. There are several reasons for this including:

- there are no isolation rooms available
- the isolation room is occupied for other reasons, e.g., security
- a risk assessment prioritises other patients with infectious disease for a room, e.g., 'open' tuberculosis
- there is insufficient staff available to care for a patient in an isolation room.

The data showed that on average 21.9% of all ICU patients were isolated; another 3.8% required isolation but could not be isolated due to a lack of facilities.

The problem of tackling MRSA in ICUs is multifaceted. It is difficult to control MRSA acquisition within a unit when the population of patients admitted have a high prevalence of MRSA on admission. While all patients are being screened upon admission, there is still a large delay in the diagnosis of MRSA using culture alone, which can take up to 48 hours or longer. Once the results are available there are often no isolation rooms available to accommodate MRSA patients therefore making the problem of containing MRSA a difficult one. An improvement in the time to diagnose patients along with an improvement in isolation room resources would enhance efforts to minimise ICU acquisition of MRSA.

This surveillance project is a simple tool for monitoring MRSA prevalence in Irish ICUs and was designed to minimise the burden of collecting data for participants. It is important to emphasise, however, the limitations of using a simple surveillance tool such as this point prevalence survey to ensure that the data reported is not misinterpreted. A point prevalence survey only captures data in the ICU on a single day each week. This is in contrast to a period prevalence which captures data every day in the ICU over a particular period of time, (e.g., a year) or incidence data, the collection of which would be even more time consuming. Therefore, the purpose of this tool is for ICUs to compare their own rates over time at a local level. It is unsuitable to compare individual ICUs.

Further improvements are underway to extend this surveillance to allow more robust stratification of ICUs by level of acuity and to allow hospitals capture other aspects of infection prevention and control such as the staff to patient ratio as a predictor of cross-infection, and the ability to staff isolation rooms. Such improvements will enhance the ability of this tool to more accurately identify the underlying issues surrounding differences in MRSA prevalence and acquisition within the ICU setting.

5.0 Appendix

Appendix A:

MRSA in ICU steering committee

The MRSA in ICU Prevalence study was developed by members of the SARI (Strategy for the Control of Antimicrobial Resistance in Ireland) Infection Control Sub-Committee. A Steering Group was established from the members of the SARI Infection Control Sub-Committee and staff from the Health Protection Surveillance Centre in 2007 to oversee the survey and provide guidance in its development and implementation. In March 2009, members of the Irish Association of Critical Care Nurses (IACCN) and the Intensive Care Society of Ireland (ICSI) joined the steering group.

Members of the steering group include:

- Dr Fidelma Fitzpatrick, Consultant Microbiologist, Health Protection Surveillance Centre (HPSC) & Beaumont Hospital, Dublin **(Chair)**
- Professor Hilary Humphreys, Consultant Microbiologist, Royal College of Surgeons in Ireland & Beaumont Hospital, Dublin
- Dr Fiona Roche, Surveillance Scientist, HPSC
- Ms Sheila Donlon, Infection prevention and control Nurse Manager, HPSC
- Ms Mairead Skally, Surveillance Scientist, HPSC
- Ms. Katie Wedgeworth, Lecturer, School of Nursing Midwifery & Health Systems and Programme leader of the Graduate Diploma in Nursing Studies (Critical Care), University College Dublin, representing IACCN and who joined in March 2009
- Ms Mairead Twohig, Infection Control, Our Lady of Lourdes Hospital Drogheda (representing the Infection Prevention Society)
- Ms Teresa Farrell, Infection Control, Sligo General Hospital (representing the Infection Prevention Society)

Appendix B:

HSE – Health Protection Surveillance Centre (HPSC) Page 1

Surveillance of MRSA in General ICUs
Baseline Institutional and ICU Demographic Data
Version 8, Feb 2008

1. Name of hospital:

2. Category of hospital:

3. Number of acute beds

< 150	<input type="checkbox"/>	300-450	<input type="checkbox"/>
150-300	<input type="checkbox"/>	>450	<input type="checkbox"/>

4. Does your hospital have recognised regional specialties, e.g. vascular surgery?

Yes ☐ No ☐

If yes, please specify

5. Does your hospital have recognised national specialties, e.g. cardiac surgery?

Yes ☐ No ☐

If yes, please specify

6. Tick the box which best describes your ICU

Non-mixed ICU ☐ Mixed ICU ☐

If mixed, please indicate the type of mix:

ICU/HDU mix ☐ ICU/CCU mix ☐ ICU/HDU/CCU mix ☐

7. How many patients were admitted to your ICU during 2007?

8. Do you routinely screen all patients for MRSA on admission to ICU?

Yes ☐ No ☐

If yes:

(i) Which sites do you routinely screen? (tick more than one box if appropriate)

Nose ☐ Groin ☐ Wound site ☐ Medical device site ☐ Other ☐

(ii) How frequently do you screen all patients thereafter?

Once weekly ☐ Other ☐

9. Is your ICU overseen by an intensivist? Yes ☐ No ☐

If yes, how many consultant sessions (one or more individuals may be involved) are dedicated to the ICU per week?

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10. How many single rooms do you have?

11. Please record specific features associated with each single room. Tick more than one box if necessary

Room 1

Neg Pressure ☐ Pos Pressure ☐ Anteroom ☐ Hand sink ☐
None of above ☐

Room 2

Neg Pressure ☐ Pos Pressure ☐ Anteroom ☐ Hand sink ☐
None of above ☐

Room 3

Neg Pressure ☐ Pos Pressure ☐ Anteroom ☐ Hand sink ☐
None of above ☐

Room 4

Neg Pressure ☐ Pos Pressure ☐ Anteroom ☐ Hand sink ☐
None of above ☐

Room 5

Neg Pressure ☐ Pos Pressure ☐ Anteroom ☐ Hand sink ☐
None of above ☐

Room 6

Neg Pressure ☐ Pos Pressure ☐ Anteroom ☐ Hand sink ☐
None of above ☐

Comment: _____

Appendix C:

HSE – Health Protection Surveillance Centre (HPSC)	
Surveillance of MRSA in General ICUs	
Weekly Census Form	
Version 8, Feb 2008	
A. Hospital code	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
A.1. ICU code	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
B. Census date	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
C. Number of available beds in the ICU	<input type="text"/> <input type="text"/>
D. Number of occupied beds in the ICU	<input type="text"/> <input type="text"/>
E. Number of patients in a single room (it does not have to be for infection control reasons)	<input type="text"/> <input type="text"/>
E.1. Number of MRSA patients that are in a single room	<input type="text"/> <input type="text"/>
F. Number of patients requiring isolation for infection control reasons, but not in a single room	<input type="text"/> <input type="text"/>
G. Total number of patients with MRSA (colonisation/infection)	<input type="text"/> <input type="text"/>
G1. Total number of new patients this week with MRSA (colonisation/infection)	<input type="text"/> <input type="text"/>
G2. The number of new patients this week with MRSA <u>acquired in your ICU</u> (colonisation/infection)	<input type="text"/> <input type="text"/>
H. Total number of patients with MRSA on systemic antibiotics appropriate for the treatment of a known or suspected MRSA infection, e.g. vancomycin, teicoplanin, linezolid, daptomycin	<input type="text"/> <input type="text"/>
I. The total number of patients that are ventilated in your ICU	<input type="text"/> <input type="text"/>
Thank you	

6.0 References

1. <http://www.hpsc.ie/hpsc/A-Z/MicrobiologyAntimicrobialResistance/EuropeanAntimicrobialResistanceSurveillanceSystemEARSS/ReferenceandEducationalResourceMaterial/SaureusMRSA/MRSAinICUPrevalenceStudy/Reports/>
2. <http://www.hpsc.ie/hpsc/A-Z/MicrobiologyAntimicrobialResistance/EuropeanAntimicrobialResistanceSurveillanceSystemEARSS/ReferenceandEducationalResourceMaterial/SaureusMRSA/MRSAinICUPrevalenceStudy/Protocol/>
3. <http://www.hpsc.ie/hpsc/A-Z/MicrobiologyAntimicrobialResistance/InfectionControlandHealthcare-AssociatedInfection/Guidelines/>
4. Bootsma MCJ, Diekmann O, Bonten MJM. Controlling methicillin-resistant *Staphylococcus aureus*: Quantifying the effects of interventions and rapid diagnostic testing. PNAS 2006 103:5620-5