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# **NATIONAL SURVEY OF MRSA 1995**

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## **INTRODUCTION**

Methicillin resistant *Staphylococcus aureus* (MRSA) is an increasingly important cause of morbidity. As a consequence expenditure on infection control measures in hospitals, nursing homes and other institutions has grown. In the USA the overall percentage of *Staphylococcus aureus* isolates resistant to methicillin rose from 2.4% in 1975 to 29% in 1991,<sup>1</sup> while in large teaching hospitals the proportion rose from 8% in 1986 to 40% in 1992. By the early 1990s it was reported that MRSA, previously confined to large hospitals, had spread into smaller hospital units and nursing homes.<sup>1</sup> Up to 10-15% of hospital pharmacy budgets is currently spent on the antibiotic vancomycin to treat infection caused by MRSA and vancomycin-sensitive enterococci.<sup>2</sup>

National guidelines on MRSA control are due to be issued in 1995. The Department of Health Committee on MRSA requested a national survey of MRSA prior to the issue of these guidelines.

## **OBJECTIVES**

The objectives of this survey were

- (1) to obtain an indication of the size of the MRSA problem in Ireland prior to the introduction of national guidelines on MRSA control; this would serve as a baseline for future studies of the effectiveness of the guidelines, and
- (2) to describe MRSA screening practices in individual hospitals.

## **METHODS**

### **1) SURVEY OF MICROBIOLOGICAL LABORATORIES**

A survey of all microbiology laboratories in the country was carried out over a two week period from 20th February to March 5th 1995. There were three parts to this survey, relating to the above objectives:

*Part 1.* For patients from whom MRSA was isolated during the study period (inpatients and outpatients) the following data were requested using a standardised data recording sheet: date of receipt of specimen in laboratory, age, sex, county of residence of patient, location of patient at time of specimen collection (home, hospital, ward type), whether patient was clinically infected or merely colonised, and source of specimen (blood, wound, sputum, urinary tract, body cavity, skin, nose or other specified).

*Part 2.* The total number of specimens (both patient and staff) for which MRSA screening was specifically requested during the study period in each laboratory.

*Part 3.* Each laboratory was requested to provide information on the screening policy for MRSA in each hospital for which the laboratory performs bacteriological testing. Questions included the following:

- the media and antibiotic used
- patient sites tested in screening for MRSA

- whether screening is done routinely or only during outbreaks
- whether staff are routinely screened
- whether the environment is tested for MRSA.

Information was also requested regarding the presence in each hospital of patients known to be infected or colonised with MRSA but from whom a specimen had not been received by the laboratory during the study period. This "reservoir" of in-patients with MRSA might otherwise be missed by the two week study window.

## *2) SURVEY OF HOSPITAL ADMINISTRATION DEPARTMENTS*

A survey of hospital administrators/secretary-managers was also performed. Data were requested regarding the following:

- the number of beds occupied on Monday February 27th 1995 ( the midpoint of the two week study period)
- the number of discharges during the period 20th February to March 5th 1995
- the breakdown of discharges by age and sex
- the breakdown of discharges by county of residence of patient.

The data were analysed using SAS (a registered trademark of SAS Institute Inc., Cary, NC, USA) on the Eastern Health Board computer system. The chi square test was used for comparison of proportions. Where the result was not significant at the 5% level this is indicated by (N.S.).

## **RESULTS**

All 45 microbiology laboratories surveyed responded. The total number of patients from whom MRSA was isolated over the 2 week period was 448.

### **SEX**

The ratio of males to females was 1.65:1 (279:169).

### **AGE OF PATIENTS**

Over 50% of patients were over 65 years (Table 1).

Table 1. Agegroups of MRSA positive patients.

AGEGROUP	N	%
0 - 4	19	4.5
5 - 14	4	0.9
15 - 24	27	6.4
25 - 44	27	6.4
45 - 64	91	21.4
65 - 74	102	24.1
75+	154	36.3
TOTAL	*424	100.0

\*Data on age missing on 24 patients.

### **COUNTY OF RESIDENCE OF PATIENTS**

Table 2 documents frequency of patients with MRSA confirmed by a laboratory during the period of the survey by county of residence, and the rate per 100,000 of the population. While almost one third of isolates were from patients resident in Dublin, the rate of 13.6/100,000 is tenth in the ranking of counties (Table 3).

Table 2. County of residence of patients from whom MRSA was isolated between 20/2/95 and 5/3/95

COUNTY	NUMBER OF PATIENTS WITH MRSA	POPULATION OF COUNTY	RATE PER 100,000 POP
Carlow	5	40,942	12.2
Cavan	11	52,796	20.8
Clare	10	90,918	11.0
Cork	25	410,369	6.1
Donegal	20	128,117	15.6
Dublin	139	1,025,304	13.6
Galway	38	180,364	21.1
Kerry	7	121,894	5.7
Kildare	17	122,656	13.9
Kilkenny	7	73,635	9.5
Laois	3	52,314	5.7
Leitrim	2	25,301	7.9
Limerick	22	161,956	13.6
Longford	2	30,296	6.6
Louth	17	90,724	18.7
Mayo	24	110,713	21.7
Meath	14	105,370	13.3
Monaghan	8	51,293	15.6
Offaly	8	58,494	13.7
Roscommon	10	51,897	19.3
Sligo	7	54,756	12.8
Tipperary	19	132,772	14.3
Waterford	9	91,624	9.8
Westmeath	3	61,880	4.8
Wexford	7	102,069	6.9
Wicklow	11	97,265	11.3
TOTAL	*445	3,525,719	12.7

\* Data on county of residence missing on 1 patient, 1 resident in Northern Ireland, 1 of no fixed abode.

Table 3. County of residence of patients from whom MRSA was isolated during the period of the study ranked in descending order per 100,000 population.

COUNTY	NUMBER OF PATIENTS WITH MRSA	POPULATION	*RATE PER 100,000 POPULATION
1. Mayo	25	110,713	21.7
2. Galway	38	180,364	21.1
3. Cavan	11	52,796	20.8
4. Roscommon	10	51,897	19.3
5. Louth	17	90,724	18.7
6. Donegal	20	128,117	15.6
7. Monaghan	8	51,293	15.6
8. Tipperary	19	132,772	14.3
9. Kildare	17	122,656	13.9
10. Dublin	139	1,025,304	13.6
11. Offaly	8	58,494	13.7
12. Limerick	22	161,956	13.6
13. Meath	14	105,370	13.3
14. Sligo	7	54,756	12.8
15. Carlow	5	40,942	12.2
16. Wicklow	11	97,265	11.3
17. Clare	10	90,918	11.0
18. Waterford	9	91,624	9.8
19. Kilkenny	7	73,635	9.5
20. Leitrim	2	25,301	7.9
21. Wexford	7	102,069	6.9
22. Longford	2	30,296	6.6
23. Cork	26	410,369	6.1
24. Kerry	7	121,894	5.7
25. Laois	3	52,314	5.7
26. Westmeath	3	61,880	4.8
TOTAL	**445	3,525,719	12.7

\*This data refers to the number of patients confirmed MRSA positive by laboratory testing during the period of the survey per 100,000 residents in each county. It does not imply that they were receiving treatment in a hospital in that county at the time of MRSA isolation and should not be regarded as indicating the level of MRSA in any particular hospital.

\*\* Data on county of residence missing on 1 patient, 1 resident in Northern Ireland, 1 of no fixed abode.

## LOCATION OF PATIENTS

MRSA was isolated from patients in almost every type of hospital ward / unit (Table 4). As expected the greatest number of specimens were from patients in surgical wards (30.3%), while medical and geriatric patients together accounted for another 30%. No data was given as to the specific ward type of some patients who were in a hospital outside that in which the laboratory is situated (ie external).

Table 4. Location of MRSA positive patients.

LOCATION	N	%
surgical unit	135	30.3
medical ward	100	22.5
geriatric ward	30	6.7
ICU	27	6.1
outpatients department	23	5.2
orthopaedics	22	4.9
external	15	3.4
paediatric ward	11	2.5
special care baby unit	11	2.5
psychiatric ward	9	2.0
burns unit	7	1.6
specimen sent in by GP	6	1.3
isolation unit	6	1.1
home	5	1.1
A&E	5	1.1
respiratory ward	5	1.1
dialysis unit	4	0.9
renal unit	4	0.9
hospice	4	0.9
day ward	3	0.7
nursing unit	3	0.7
gynaecology ward	2	0.4
oncology unit	2	0.4
plastic surgery unit	2	0.4
cardiac ward	1	0.2
ent ward	1	0.2
high dependency unit	1	0.2
TB ward	1	0.2
TOTAL	*445	100.0

\* Data on location missing on 3 patients.



## SOURCE OF MRSA POSITIVE SPECIMENS

MRSA was isolated in the main from the following sites: wounds, nose, skin, sputum and throat (Table 5).

Table 5. Sites of MRSA positive specimens.

SITE	N	%
wound	151	23.8
nose	138	21.8
skin	89	14.0
sputum	72	11.4
throat	48	7.6
urine	23	3.6
groin	17	2.7
body cavity	14	2.2
eye	10	1.6
perineum	8	1.2
blood	7	1.1
umbilicus	7	1.1
ear	7	1.1
penis	5	0.8
rectum	5	0.8
axilla	5	0.8
central line tip	3	0.4
tracheostomy	3	0.4
abscess	2	0.3
drain	2	0.3
iv site	2	0.3
peg feeding tube	2	0.3
mouth	2	0.3
skin graft	1	0.2
hallux	1	0.2
pilonidal sinus	1	0.2
arterial line	1	0.2
sore on leg	1	0.2
limb stump	1	0.2
sinus	1	0.2
site of orthopaedic pin	1	0.2
colostomy	1	0.2
not specified	2	0.3
TOTAL	*633	

\*The total exceeds 448 as in many patients MRSA was isolated from more than one of the sites listed.

## INFECTION / COLONISATION WITH MRSA

Of the 448 MRSA positive cases 127 (28.3%) patients were considered to be infected, 264 (59%) were colonised and in 57 (12.7%) patients it was not known whether there was infection or colonisation.

Table 6 demonstrates the agegroups of the 391 patients where infection / colonisation status was known; 62.2% of infections occurred in the over 64 agegroup.

Table 6. Ages of patients infected or colonised with MRSA.

AGEGROUP	INFECTION		COLONISATION	
	N	%	N	%
0 - 4	4	3.4	13	5.1
5 - 14	0	0.0	3	1.2
15 - 24	10	8.4	14	5.5
25 - 44	10	8.4	17	6.7
45 - 64	21	17.6	62	24.5
65 - 74	40	33.6	49	19.4
75+	34	28.6	95	37.6
TOTAL	*119	100.0	*253	100.0

\*Data on age missing on 19 patients.

Sixty percent of infections occurred in male patients and correspondingly 62.5% of colonised patients were male. Of the patients where infection / colonisation status could be established, 150 were female and 241 were male. Of the females 34% were infected compared with 32% of the males. Over one quarter (27.6%) of infected patients and 31.9% of colonised patients were in surgical wards.

Table 7. Location of infected & colonised patients.

LOCATION	INFECTION		COLONISATION	
	N	%	N	%
surgical unit	35	27.5	84	31.9
medical ward	26	20.5	62	23.6
orthopaedics	10	7.9	11	4.2
geriatric ward	9	7.1	17	6.5
ICU	8	6.3	17	6.5
specimen sent by GP	6	4.7	0	0.0
outpatients department	4	3.2	15	5.7
external	4	3.2	6	2.3
paediatric ward	3	2.4	6	2.3
psychiatric ward	3	2.4	4	1.5
A&E	3	2.4	0	0.0
special care baby unit	2	1.5	9	3.4
home	2	1.5	1	0.4
renal unit	2	1.5	2	0.7
day ward	2	1.5	1	0.4
respiratory ward	1	0.8	3	1.1
dialysis unit	1	0.8	3	1.1
hospice	1	0.8	3	1.1
gynaecology ward	1	0.8	1	0.4
oncology unit	1	0.8	1	0.4
plastic surgery unit	1	0.8	1	0.4
high dependency unit	1	0.8	0	0.0
TB ward	1	0.8	0	0.0
burns unit	0	0.0	6	2.3
isolation unit	0	0.0	5	1.9
nursing unit	0	0.0	3	1.1
cardiac ward	0	0.0	1	0.4
ent	0	0.0	1	0.4
TOTAL	*127	100.0	*263	100.0

\*Data on location missing on 1 patient.

Table 8 documents the patient site from which MRSA was isolated. Seven patients had MRSA on blood culture.

Table 8. Site of MRSA by infection / colonisation.

SITE	INFECTION		COLONISATION		TOTAL
	N	%	N	%	
wound	77	52.2	66	47.8	143
nose	27	17.5	104	82.5	131
skin	16	19.0	68	81.0	84
sputum	23	39.7	35	60.3	58
throat	3	7.1	39	92.9	42
urine	11	61.1	7	38.9	18
groin	5	33.3	10	66.7	15
body cavity	10	71.4	4	28.6	14
perineum	1	12.5	7	87.5	8
eye	1	12.5	7	87.5	8
blood	7	100.0	0	0.0	7
umbilicus	3	42.9	4	57.1	7
ear	1	16.7	5	83.3	6
penis	2	40.0	3	60.0	5
rectum	0	0.0	5	100.0	5
axilla	0	0.0	4	100.0	4
central line tip	1	33.3	2	66.7	3
tracheostomy	1	33.3	2	66.7	3
abscess	1	100.0	0	0.0	1
drain	2	100.0	0	0.0	2
iv site	1	50.0	1	50.0	2
peg feeding tube	0	0.0	2	100.0	2
mouth	2	100.0	0	0.0	2
skin graft	0	0.0	1	100.0	1
hallux	0	0.0	1	100.0	1
pilonidal sinus	1	100.0	0	0.0	1
arterial line	1	100.0	0	0.0	1
site of orthopaedic pin	0	0.0	1	100.0	1
colostomy	0	0.0	1	100.0	1
not specified	0	0.0	2	100.0	2
<b>TOTAL</b>	<b>187</b>			<b>381</b>	<b>*568</b>

\*Total exceeds 391 as in some patients MRSA was isolated from more than one of the sites listed.

### **PATIENT & STAFF SCREENING SPECIMENS RECEIVED FOR ANALYSIS**

Over the two week period the total number of MRSA screening specimens from both patients and staff received by laboratories for bacteriological analysis was 5,830. The number received by individual laboratories ranged from 0 to 689 (mean 130).

## **BACTERIOLOGICAL TESTING BY LABORATORIES**

Eighteen different media or media combinations are used for MRSA detection by the 45 laboratories. Over three quarters (80.5%) state that methicillin is used to diagnose MRSA; 14.8% oxacillin; 3.7% methicillin discs with oxacillin medium; and 1.2% methicillin and gentamicin.

## **HOSPITAL SCREENING PRACTICES**

Screening practice protocols for 82 hospitals served by the 45 microbiology laboratories have been obtained.

## **INFECTION CONTROL NURSES**

Forty four (53.7%) hospitals currently have an infection control nurse, either full-time or part-time.

## **SCREENING OF PATIENTS FOR MRSA**

Fifty five (67.1%) hospitals screen certain patient groups routinely for MRSA; the remaining 27 (32.9%) screen only if an outbreak occurs.

The body sites screened routinely are documented in Table 9.

Table 9. Patient sites screened routinely for MRSA (55 hospitals).

SITE SCREENED	N	%
nose	55	100.0
axilla	42	76.4
throat	32	58.2
perineum	32	58.2
groin	23	41.8
wound	21	38.2
abnormal skin	18	32.7
csu	18	32.7
sputum	13	23.6
hairline	10	18.2
iv access site	8	14.5
hands	7	12.7
umbilicus	7	12.7

The umbilicus is screened in neonates only. Where wound, abnormal skin, sputum, catheter specimen of urine and iv access site are cited these are dependent on the patient status at the time of screening.

Table 10. Patient groups screened in the 55 hospitals which routinely screen for MRSA.

PATIENT GROUP	N	%
transfers from other hospitals	48	87.3
patients previously infected/colonised with MRSA	46	83.6
transfers from nursing homes	33	60.0
on admission to icu	10	18.2
patients being transferred to another hospital	7	12.7
weekly screen of patients in icu	5	9.1
admissions for cardiac surgery	3	5.5
pre total hip / knee replacement surgery	2	3.6
admissions from the community	2	3.6
on admission to liver unit	1	1.8
monthly screen of longstay patients	1	1.8
patients returning to OPD	1	1.8
patients who have been in another hospital during the preceding year	1	1.8
preoperative screen of patients who will need to go to icu postoperatively	1	1.8
pre-orthopaedic surgery	1	1.8
admissions to babyunit	1	1.8
bedbound/chronically ill patients on antibiotics on admission	1	1.8
admissions to isolation unit	1	1.8
weekly screen of patients in liver unit	1	1.8

The patient groups routinely screened are listed in Table 10; screening practice focuses on patients transferred from other hospitals or nursing homes and those previously infected/colonised with MRSA.

### **SCREENING OF STAFF**

In reply to the question 'do you screen staff?' 73 (89.0%) hospitals answered 'yes' and a further 6 (7.3%) answered that they screened occasionally or not routinely; just 3 (3.7%) said they did not screen staff.

Of the 79 hospitals which screen staff, details of screening practices were given for 49 (62.0%) hospitals: all screen during outbreaks of MRSA; 8 screen all doctors and nurses on employment also; 1 hospital screens in addition all doctors commencing working in surgery and nurses commencing in ICU, and 1 hospital screens all anaesthetic staff every six months.

### **SCREENING OF THE ENVIRONMENT FOR MRSA**

Fifty one (62.2%) hospitals screen the environment for MRSA.

## *RESERVOIRS OF MRSA INFECTION*

Data was provided on 71 hospitals by the microbiology laboratories which serve them, regarding the existence of a known reservoir of MRSA infected / colonised patients who were in the hospital during the period of the study but from whom a screening specimen was not received by the laboratory (i.e. diagnosis of MRSA made prior to commencement of the study); 16 hospitals had such a reservoir of infected patients and data regarding the number of patients was provided on 15. The total number of such patients was 111, with the number in individual hospitals ranging from 24 to 1 (median 5).

An estimate of the period prevalence rate of MRSA infection / colonisation for the study duration can be obtained from the sum (559) of the number of patients diagnosed as MRSA positive during the period of study (448) plus the number of MRSA positive patients in the reservoirs of infection in the hospitals during the period (111); since data is missing on reservoirs of infection in 12 hospitals; and the data only includes those patients screened for MRSA this period prevalence rate of 15.9 / 100,000 pop. (using the population of Ireland as denominator) must be considered as the minimum rate.

## *ADMINISTRATIVE DATA*

Fifty seven of the 59 hospitals surveyed responded to the questionnaire sent to administrators / secretary-managers (96.6%). Due to the inability of one laboratory to distinguish isolates from a group of hospitals, the administrative data on this group was treated as if from a single hospital, giving a total of 55 hospitals.

While all 55 hospitals provided the numbers of total discharges and occupied beds, data regarding the breakdown by age and sex was given by 44 hospitals, and the breakdown by county of residence of patient by 42 hospitals.

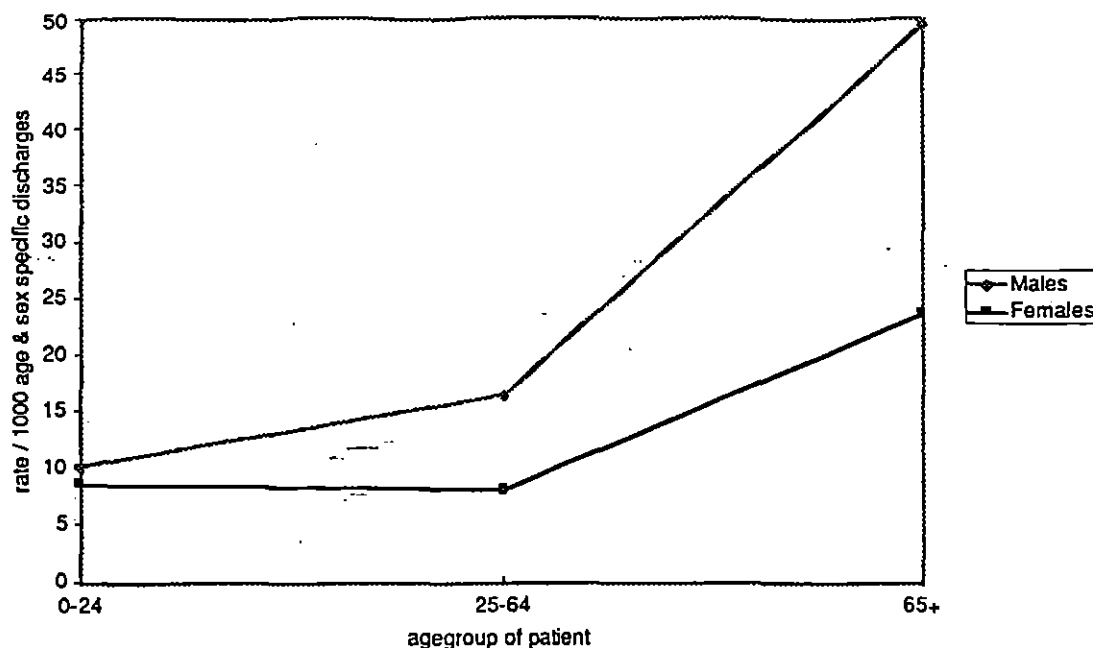
## *MRSA IN RELATION TO DISCHARGES AND BED OCCUPANCY*

The period prevalence rate of MRSA was 16.5 / 1000 discharges and 36.2 / 1000 beds occupied. The rate of MRSA in males was 25.5 / 1000 male discharges and the rate in females was 13.0 / 1000 female discharges.

## *AGE AND SEX SPECIFIC RATES OF MRSA*

The rate of MRSA was greater in males than in females in all agegroups, with the difference most marked in the over 65 agegroup (Fig 1).

Fig 1. Age & sex specific rates of MRSA (per 1000 age & sex specific discharges).



### MRSA BY HEALTH BOARD AREA

Rates were also calculated for the number of cases of MRSA in patients resident in each health board area per 1000 patients discharged from all hospitals who were resident in the same health board area (Table 11). The rate ranged from 8.7/1000 to 25.3/1000.

Table 11. Rate of MRSA positive patients resident in a health board area / 1000 residents of that health board area discharged\*.

HEALTH BOARD AREA	RATE / 1000 DISCHARGES
Western Health Board	25.3
North Eastern Health Board	24.2
Eastern Health Board	20.3
Mid Western Health Board	19.5
Southern Health Board	15.3
North Western Health Board	15.1
South Eastern Health Board	10.2
Midland Health Board	8.7

\*These rates were calculated using county of residence of patients as numerator and denominator. In many cases patients were being treated in hospitals located in health board areas other than their area of residence. Therefore the rates cannot be used to infer a problem in any particular hospital or group of hospitals.



## **DISCUSSION**

The microbiology laboratories and hospital administration departments responded in a very timely fashion to this survey and the response rate has been excellent. The survey window of two weeks may not capture the full extent of the problem as the rates of infection in individual hospitals may fluctuate from week to week. In addition the pick-up of MRSA depends in part on screening practices which clearly vary. However it should serve as a useful baseline against which to measure the effect of the national guidelines for MRSA control.

MRSA is clearly a problem in Irish hospitals as a substantial number of isolates were recorded in the relatively short survey window. The majority of MRSA positive patients are elderly men, and at all ages males predominate; male sex has been previously documented as a predictor of MRSA colonisation.<sup>3</sup>

Patients in surgical and medical wards were most commonly colonised / infected, while the documentation of isolates from intensive care units, special care baby units and oncology wards indicates a potentially very serious problem. A high prevalence of MRSA in medical, surgical and intensive care units has been well documented internationally.<sup>4,5</sup>

It has been shown that in hospitals where infection control measures are strictly enforced the incidence of infections due to resistant microorganisms can be reduced.<sup>6</sup> Inappropriate use of antibiotics must be curtailed also to address the problem.<sup>6</sup> Considerable microbiology laboratory support is essential.<sup>5</sup>

While MRSA is largely a nosocomial pathogen, the increasing trend for day case procedures, shorter hospital stays and home-based parenteral therapy means that nosocomial infection will likely increase as a problem in the community also.<sup>7</sup> A recent study of MRSA at a university hospital in the USA revealed 41% of MRSA cases to be community-acquired, with 8% of these having no identified risk factors (hospital admissions, antibiotic use, nursing home residence or intravenous drug use).<sup>8</sup> Canadian hospital studies have revealed that 62% of MRSA-positive patients had MRSA present at admission to hospital.<sup>9</sup>

While this study highlights the workload imposed on microbiological laboratories by MRSA it must be remembered that our figures will underestimate this workload, as the figure of 448 represents only 1 isolate from each patient, and these patients may have had multiple sites screened and repeat testing performed. The current variation in screening practices in different hospitals means that the workload of individual laboratories varies greatly. The need for standardised guidelines is apparent.

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