Screening programmes for Hospital Acquired Infections

European Diagnostic Manufacturers Association

***In Vitro* Diagnostics**

Making a real difference in health & life quality

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HAI Facts

- Every year, an estimated ***6 million people*** are affected by Hospital Acquired Infections (HAI) worldwide, of which about ***3 million in the European Union*** (up to ***10% of hospital admissions***), making it a major contributor to morbidity and mortality[1]. HAI affects an estimated ***1 in 10 patients in Europe***[2]. It is one of the most prominent reasons of failure of advanced and expensive medical treatment.

- In the ***UK, 5,000 patients die each year*** as the result of HAI[3]. In ***Europe***, each year an estimated 60,000 persons or ***more than 150 persons each day*** die due to HAI.

- Many organisms causing HAI are resistant to some kinds of treatment regimens (a phenomenon commonly known as ***"antimicrobial resistance"***), thus being difficult to cure. The most common HAI's are:
  - ***MRSA*** or *Methicillin Resistant Staph aureus*
  - ***VRE*** or *Vancomycin Resistant Enterococci*, and
  - Namely in the USA and also increasingly in Europe, ***ESBL*** or *enterobacteriaceae* with an *Extended Spectrum Beta Lactamase*
  - Multidrug-resistant Acinetobacter baumanii

- The proportion of these resistant strains is increasing and becoming much more frequent among HAI. Without preventive measures the number of affected patients will also increment gradually. HAI are estimated to ***increase at 1.7% per year worldwide***.

- Hospital Acquired Infections:
  - ***Increase mortality***: Patients with a MRSA Blood Stream Infection have a 2 times higher mortality risk than patients with a MSSA (*methicillin sensitive Staphylococcus aureus*) infection[1]
  - ***Increases length of hospital stay*** on average with 8 days per affected patient[4]: 4 days per "simple" HAI, 10 days per MRSA infection, 16 days per *bacteremia* and 8 days in intensive care (ICU)
  - ***Are a burden on Health Care Costs***: It is estimated that HAI add more than 10 million unnecessary patient days in Europe. In the UK, only the total cost for treating and controlling HAI is estimated to be £1 billion (€1,476 million) per year and causing 5,000 deaths[5]

- The ***average cost*** for a Hospital Acquired Infection is estimated to be ***€2,300***, ***€8,000*** in case of ***MRSA*** being involved***,*** and ***€40,000*** in case it results in a ***blood stream infection .***

Diagnostics are Indispensable

*"Twenty-five years of data show that without **active surveillance culture** to identify the colonised reservoir, prevention will fail. Repeated successes associated with the use of active surveillance cultures and contact isolation are not due to chance alone. **Endemic MRSA or VRE does not disappear from institutions spontaneously.** (…) **We should not accept the current state of VRE and MRSA infections in our hospitals.** It is not consistent with "good clinical governance". **Patient safety should be our top priority.** Active surveillance cultures will detect the unrecognized MRSA- or VRE-colonised patients and help prevent transmission and infections. Isn't this the goal of infection control and healthcare epidemiology ? Isn't this **true promotion of healthcare quality** ? Do we have to wait until consumers or their lawyers demand implementation of these programs ? **The time to act is now**"*

Jarvis W.R.[6]

The essential role of *In Vitro* Diagnostics

- **In the screening of incoming patients and patients at risk wards**
  - Screening programmes with rapid diagnostic tests have proven to significantly contribute to setting up promptly appropriate infection control measures of HAI and the reduction of the spread within the hospitals and patients. Identifying patients (carriers) with Multi Drug Resistant bacteria allows to ***implement the appropriate infection control measures*** (patient isolation or cohorting and reinforced hygiene measures). A ***Dutch study*** on ICU patients indicated a 38 fold grater rate of transmission from un-isolated unknown positive patients with universal precautions compared to identified isolated positives cared for with gowns, masks and gloves[7].

- **Appropriate screening and monitoring contributes significantly to improved health outcome**
  - Countries with active surveillance programs (e.g. The Netherlands, Denmark, Finland, etc.) ***succeed in controlling HAI caused by MRSA*** and in stabilising resistance rates.
  - A ***French study*** proves the ***effectiveness of MRSA control programs***. In a hospital which was successful, costs for 18 colonised patients and 4 infections over a 10-month time period were estimated to be $49,000 to $69,000 (€38,625- €59,391). In another hospital which was less efficient in the control and prevention of the spread of MRSA, the costs over a 31-month time period and 75 associated *bacteraemias* and 14 deaths were $1.3 million[8] (€1.03 million).
  - Unnoticed MRSA colonisation upon patient admission increases the ***risk for getting a MRSA infection during hospital stay with a factor of 10***.

- **Screening leads to significant cost savings for healthcare systems and the society**
  - Evaluations have proven that the cost of screening programs easily pays back for itself. It ***prevented 8-41 MRSA infections per year in a hospital*** in a specific example[9]. If infection control measures prevent more than 7% of infections, the cost of the programmes would be covered[10].
  - A ***UK study*** indicated that a 10% reduction in the number of nosocomial infections could result in a ***saving of €150 million per year***.
  - A ***SENIC study*** (1976) reported in Haley publications shows that ***added treatment cost*** for an MRSA infection is estimated to be ***€10,000 to €35,000 per case***[11].

- It ***reduces mortality rates***, length of ***stay*** and ***improves patient outcome*** and as such, reduces significantly physical and emotional suffering.

A concrete example: MRSA

Cost-benefit analysis of MRSA control based on admission screening & isolation of carriers

Study: Nettleman, Am J Med, 1991

Setting	Prevalence	Policy	Impact	Cost-Benefit
			50% decrease in nosocomial cases	

Study: Jernigan, ICHE 1996

Setting	Prevalence	Policy	Impact	Cost-Benefit
University Hospital	0.2%	Screening Isolation	Reduced nosocomial transmission	Yes

Study: Papia, ICHE 1999

Setting	Prevalence	Policy	Impact	Cost-Benefit
University Hospital	1.3%	Screening Isolation Decontamination	38% decrease nosocomial cases	Yes

Study: Chaix, JAMA 1999

Setting	Prevalence	Policy	Impact	Cost-Benefit
MICU	4%	Screening Isolation Decontamination	75% reduction in ICU cases	Yes

Study: Harbarth, J. Hosp Infect 2000

Setting	Prevalence	Policy	Impact	Cost-Benefit
			60% decrease	

Study: Folorunso, ICHE 2000

Setting	Prevalence	Policy	Impact	Cost-Benefit
			50% decrease	

Study: Lucet, 2003

Setting	Prevalence	Policy	Impact	Cost-Benefit
14 ICU	3.7 – 20%	Screening Isolation Decontamination		Yes

Active Surveillance Cultures

Active surveillance cultures required to identify MRSA carriers are ***justified & efficient*** on ***medical*** and ***economical*** stand points:

- **Reducing the number of MRSA infections through:**
  - ***Avoiding cross transmission between patients (generally through healthcare workers)***[12]. This strategy is effective and reduces the number of MRSA infections[13].
    - The MRSA Search & Destroy strategy adopted in the Netherlands for a long time works and contributes to maintain oxacillin resistance under 0.5%[14].
    - Close contact with a MRSA colonised or infected patient increases 7.5 folds the risk of becoming MRSA colonised[15]. MRSA transmission was shown to be 38-fold lower if patients are identified and isolated[7].
    - The number of MRSA bloodstream infections can be reduced by 60% with effective prevention programmes[16].
    - Relying only on routine culture of specimens to identify MRSA carriers fails to recognize 66% of the MRSA reservoir[17].
  - ***Active MRSA identification combined with increased use of alcohol-based hand rubbing*** was associated with significant drop in MRSA cross-transmission and infections[18].
  - ***Avoiding the auto-infection of colonised patients***. A colonised patient has a higher risk to become infected than a non-colonised patient: 25% patients among those colonised with MRSA will become infected[19]. This justifies local disinfection policies (e.g.. with Mupirocine ointment)[20].
- **Adjusting the antibiotic surgical prophylaxis according to the patient MRSA status.** Standard microbial prophylaxis at the time of surgery does not cover MRSA. Recognition of MRSA status will allow to adapt surgical prophylaxis and prevent surgical site post operative infections[21].
- **Controlling the level of methicillin resistance among *S. aureus*.** All countries applying an active surveillance culture policy succeeded in maintaining very low methicillin resistance rate (< 0.5% in the Netherlands and Finland, while Denmark observed a decline from 33% in 1960 to 1% 25 years later). Control of MRSA resistance level is today mandatory to avoid emergence and spread of Vancomycin Resistant *Staphylococcus aureus* (VRSA).
- **Providing health care cost-effectiveness.**
  - ***MRSA infections are costly:*** between $14,360 (€11,533)[22] and $35,000 (€27,588)[11]; or € 9,261 for Herr[23]. A MRSA bloodstream infection is more expensive than a Methicillin Susceptible *S. aureus* bloodstream infection[24]: around $17,000 (€13,400) more according Abramson[25].
  - ***An active infection control programme***, including surveillance cultures and contact isolation, ***reduces number of infections, as well as hospitalization costs***[26]**:**
    - Jernigan J. A. estimated savings between $20,000 and $460,000 (€15,766-€362,607) annually while preventing 8 to 41 MRSA infections[9].
    - Chaix C. showed that a reduction of the MRSA infection rate of 14% would make a prevention program economically beneficial[8].
    - Excess cost of MRSA bloodstream infections was 19 to 27-fold more than the cost of surveillance cultures and contact isolation in the study conducted by Karchmer[27].

The screening of MRSA carriers with surveillance cultures is therefore a key step in reducing nosocomial infections.

Recommendations

- ***Active surveillance screening of incoming patients in the hospital*** for MRSA and VRE carriage should be carried out.

- ***Patients upon admission at risk wards should be screened for MRSA.*** Units at high risk for suffering serious MRSA infections or a high proportion of MRSA infections among colonised patients include :
  - Intensive care
  - Neonatal intensive care
  - Burns
  - Transplantation
  - Cardiothoracic
  - Orthopaedic
  - Trauma
  - Vascular surgery
  - Renal
  - Regional, national and international referral centres
  - Other specialist units as determined by the Infection Control Team and as agreed with the senior clinical staff of the units and relevant hospital management structure.

- ***Patients at high risk wards should be screened regularly*** (e.g. weekly).

- ***Staff screening*** is indicated if transmission continues on a unit despite active control measures, or if epidemiological aspects of an outbreak are unusual or if they suggest persistent MRSA carriage by staff.
  - We recommend that a minimum of 3 screens at weekly intervals while not receiving anti-microbial therapy be performed before a staff member can be considered to be clear of MRSA

This paper has been prepared by the ***EDMA Value of IVDs Task Force***.

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