



Cost impacts of pooled ESwab culture method in MRSA screening: a four-year experience from eastern Finland

Jari Karhukorpi¹, Tuula Leskinen¹, Heli Heikkinen², Ritva Kontkanen² and Jukka Heikkinen²

¹Eastern Finland Laboratory Centre Joint Authority Enterprise (ISLAB), Joensuu, FINLAND

²Department of Hospital Hygiene and Infection Control, North Karelia Central Hospital, Joensuu, FINLAND



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Background

- Methicillin-resistant *Staphylococcus aureus* (MRSA) incidence rates began to increase during years 2007-2008 in North Karelia Hospital District in eastern Finland (Figure 1). Similarly, the need for MRSA screening increased considerably. The peak number of MRSA screening samples per year was 27 281 in 2009 (Figure 2).
- Albeit effective, the recommended multiple body-site MRSA screening is costly to the health care system. Thus, a pooled MRSA enrichment culture method was implemented in the beginning of 2012 with intention to reduce the costs of large-scale MRSA screening and to better manage the challenges related to increased number of daily MRSA screening samples in microbiology laboratory.

Materials and Methods

- Altogether 94 911 MRSA screening samples from 10 644 different patients were studied during years 2008-2015. Pooled ESwab (Copan) method with MRSA enrichment culture was validated and implemented for routine MRSA screening at the turn of the year 2011/2012. It replaced the four separate MRSA cultures taken from nose, throat, perineum and groin. The costs of pooled ESwab MRSA screening (years 2012-2015) were compared to those costs that would have materialized if four separate samples had been cultured and charged similarly as earlier.

Results and Conclusions

- The mean annual number of patients screened for MRSA was 2369 and 2108 before and after the pooling method was implemented (Figure 3). Although the numbers of patients screened for MRSA remained almost the same during the study period the mean annual number of MRSA screening samples was reduced from 16 907 (year 2011) to 4287 (during years 2012-2015). The total laboratory cost savings during 2012-2015 were estimated to be 445 527 € (mean 111 382 €/year). Most of it resulted from the use of pooled ESwab method. Also the workload in the microbiology laboratory was considerably reduced. With hindsight, it can be said that the shift from separate MRSA cultures to the pooled MRSA cultures should have been done a little earlier (Figure 1).



In brief:

- There are currently 20 Hospital Districts in Finland. North Karelia Hospital District (dark blue) is the easternmost of them all with population of 168 800 and belongs to specific catchment area of Kuopio University Hospital (light blue). http://vnk.fi/documents/10616/343825/Kuukauden_termit_2012-2014.pdf/c94ea18a-bf85-4ca7-9a49-1747e3384c25
- In North Karelia, MRSA incidence rates began increase during 2007 and 2008 in several nursing homes and wards providing long-term care for elderly and disabled citizens (Figure 1).
- The annual number of MRSA screening samples increased also substantially (Figure 2) and this caused extra financial burden to local municipalities (Figure 3) and also extra workload to the microbiology laboratory.
- To reduce laboratory costs of MRSA screening and to ease the workload in the laboratory a pooled MRSA culture method was introduced in November-December 2011.
- Laboratory costs of MRSA screening have substantially reduced after implementation of the pooled MRSA culture method (Figure 3) even though the annual number of patients screened for MRSA has remained almost as before (Figure 2).

Separate MRSA cultures vs one pooled MRSA screening culture:



New method has been used since the beginning of the year 2012
 ⇒ One pooled MRSA culture from nose, throat, perineum* with ESwab (Copan): Laboratory costs 15 €/patient

Old method was used until the end of the year 2011
 ⇒ Separate MRSA cultures from nose, throat, perineum and groin* with M40 Transystem (Copan): Laboratory costs 60 €/patient

*New national recommendations of anatomical sites to be used in MRSA screening were published in 2014 by National Institute for Health and Welfare and since then no groin samples have been taken in our area.

Figure 1. New MRSA cases in North Karelia during years 1995-2016 (Data from National Institute for Health and Welfare, Finland)

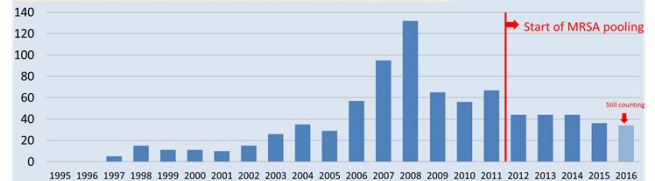


Figure 2. The number of MRSA screening samples and the number of patients screened for MRSA (2008-2015)

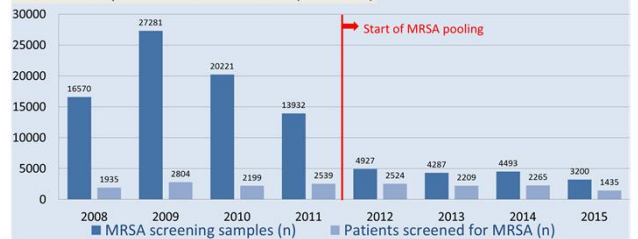


Figure 3. The annual laboratory costs (€) of MRSA screening before and after implementation of the pooled MRSA culture method.



Validation of the pooled Eswab method in MRSA screening

Both separate and pooled nose, throat, perineum and groin MRSA screening samples were collected from 66 previously known MRSA carriers (mainly elderly people living in long-term care facilities). Approval from the local ethical committee was obtained as well as informed consent from the participants or their relatives. Separate samples were taken first with M40 Transystem swab (Copan) and after that pooled samples were taken with MRSA ESwab (Copan). After arrival to the laboratory the samples were transferred into cefoxitin containing MRSA enrichment broth and incubated overnight at 35 C. Next day chromID MRSA plates (bioMerieux) were cultured and typical green colonies were studied with standard methods and GenomEra MRSA/SA PCR assay (Abacus Diagnostics, Finland), also susceptibility testing was done.

The results with one pooled culture taken from nose, throat, perineum and groin were in good agreement with the combined results of four separate cultures. Discrepant results were obtained from 3/66 patients. (Table 1).

The pooled MRSA culture method was implemented as the routine method for MRSA screening in North Karelia Hospital District at the turn of the year 2011/2012. In addition to the pooled MRSA sample also separate samples from wounds, urine etc are still studied separately from the pooled sample.

Table 1. Comparison of results obtained with separate cultures vs pooled culture (number of patients 66).

	Combined results of separate cultures taken from nose, throat, perineum and groin		
	Positive	Negative	
Pooled culture	Positive	32	1
	Negative	2	31

Measure of agreement (kappa-value): 0.9

The drawbacks of this method:

- When a new positive MRSA case is found by using the pooled ESwab MRSA screening method a second sample set with separate samples from nose, throat and perineum is needed to solve out the exact anatomical sites of the MRSA carriage. Taking these additional samples may be inconvenient for the patient and also an extra work for those who have to take MRSA samples.
- In spite of this harm the pooled MRSA screening will be continued for the time being, at least until simple, fast and cost-effective nucleic acid based screening methods will be available to us.