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ePartication:

The general public's perception of Methicillin Resistant Staphylococcus Aureus and Antibiotic Stewardship Programs.

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Master assignment Master of Psychology
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Nienke de Jong
Oldenzaal, februari 2012

Contents

Abstract

Purpose. MRSA prevalence in the Netherlands is lower than it is in adjacent countries. The Dutch healthcare system is increasingly confronted with patients seeking care abroad, which increases the risk of MRSA-colonization. Patients (and the general public) are a major factor in the transmission of Healthcare Associated Infections (HAIs). Their cooperation is necessary for effective infection prevention and –control in a cross-border healthcare setting. Effective participation is only possible when patients are well informed and are willing and able to take up an active role in both treatment and prevention. Purpose of this study is to determine what knowledge and skills the general public needs to enable such participation via an ePanel, by including opinions of different stakeholders. Participation via an ePanel is illustrated through the European Patients Empowerment for Customized Solutions ePanel.

Methods. A list of items was developed based on existing literature on perception and knowledge of the general public about MRSA and antibiotic resistance. The items were used as input for a Delphi study with clinical microbiologists, infection control professionals, health service organization employees and (former) MRSA-patients. An item was included in the final item list when all but one respondent rated it as being important knowledge for the general public. Remaining items were fed back to the respondents accompanied by the other respondents' opinions and re-rated. Additionally respondents were asked to suggest additional items and sources of information the general public could use to gather reliable information on MRSA and antibiotics use. Overarching categories of knowledge were suggested and evaluated in the final round. A total of three Delphi-rounds were performed.

Results. A total of four clinical microbiologists, five infection control professionals, six health care organization employees and five (former) MRSA-patients participated in the Delphi procedure. After the first round four of 45 items were directly selected for the final item list. In the second round, 102 items on knowledge and information sources were presented to the respondents, of which eight were directly selected. In the third round 84 items were presented to the respondents and 10 were selected for the final item list. A total of four of the 16 overarching categories were selected. Ultimately, a total of 26 items were included in the final item list.

Conclusion. It was difficult for the stakeholder groups to reach consensus on what knowledge is important for the general public and where they can find this information. Consensus within each stakeholder group was much higher, which may imply that differences are due to profession or personal experiences of the stakeholder groups. Patients and clinical microbiologists reached within group consensus most often and health service organization employees least often. Gaps between the Delphi study and existing national MRSA- and ASP-guidelines are found, especially for socio-emotional and patient participation items, which were not included in the guidelines. Similarities between the Delphi study and www.mrsa-net.nl were much higher, possibly due to the fact that they are both aimed at informing members of the general public. The stakeholders reached consensus on relatively few information sources. All those information sources require that the general public actively seeks for the information. However, since awareness is limited, an interactive information application should be developed and can be applied via an ePanel. The EPECS ePanel in its current form suffers from generalizability issues and needs further development before it could be used for such purposes.

Samenvatting

Aanleiding. De MRSA prevalentie in Nederland is lager dan in naburige landen. Het Nederlandse gezondheidszorg system wordt steeds meer geconfronteerd met patiënten die zorg gebruiken in het buitenland, wat het risico op MRSA-colonisatie verhoogt. Patiënten (en burgers) zijn een belangrijke factor in het verspreiden van ziekenhuisinfecties. Hun medewerking is noodzakelijk voor effectieve infectiepreventie en –controle in grensoverschrijdende gezondheidszorg. Effectieve participatie is alleen mogelijk als patiënten goed geïnformeerd, bereid en in staat zijn om een actieve rol in behandeling en preventie op zich te nemen. Het doel van dit onderzoek is te bepalen welke kennis en vaardigheden burgers nodig hebben om deze participatie mogelijk te maken via een ePanel, door meningen van verschillende experts te vragen. Participatie via een ePanel wordt geïllustreerd aan de hand van het EPECS ePanel.

Methoden. Een lijst items is ontwikkeld op basis van bestaande literatuur over de perceptie en kennis van burgers over MRSA en antibiotica resistentie. De items zijn gebruikt als input voor een Delphi studie met artsen-microbioloog, ziekenhuis hygiënisten, GGD (Gemeentelijke Gezondheidsdienst) medewerkers en (voormalig) MRSA-patiënten. Items werden geïncludeerd in de uiteindelijke lijst als op één na alle respondenten een item beoordeelden als zijnde belangrijke kennis voor burgers. Overgebleven items werden teruggekoppeld naar de respondenten, voorzien van de meningen van de andere respondenten en werden opnieuw beoordeeld. Ook werden respondenten gevraagd voorstellen te doen voor aanvullende items en mogelijke bronnen van informatie die burgers kunnen gebruiken om betrouwbare informatie over MRSA en antibioticagebruik te verkrijgen. Ten slotte werden overkoepelende categorieën van kennis voorgesteld en geëvalueerd in de laatste ronde van de Delphi. In totaal werden drie Delphi-rondes uitgevoerd.

Resultaten. In totaal namen vier artsen-microbioloog, vijf ziekenhuishygiënisten, zes GGD medewerkers en vijf (voormalig) MRSA-patiënten deel aan de Delphi procedure. Na de eerste ronde werden vier van de 45 items direct geselecteerd voor de uiteindelijke lijst. In de tweede ronde werden 102 items over kennis en informatiebronnen voorgelegd aan de respondenten, waarvan er acht werden geselecteerd. In de derde ronde werden 84 items voorgelegd aan de respondenten en werden er 10 geselecteerd. In totaal werden vier van de 16 overkoepelende categorieën geselecteerd. Uiteindelijk werden in totaal 26 items geïncludeerd in de uiteindelijke item lijst.

Conclusie. Het was moeilijk voor de expert-groepen om consensus te bereiken over welke kennis belangrijk is voor burgers en waar zij die informatie zouden kunnen vinden. Consensus binnen elke expert-groep was veel hoger, wat impliceert dat de verschillen worden veroorzaakt door professie of persoonlijke ervaringen van de groepen. Patiënten en artsen-microbioloog bereikten het vaakst en GGD medewerkers bereikten het minst vaak consensus binnen hun groep. Verschillen tussen het Delphi onderzoek en bestaande nationale MRSA- en antibioticagebruik-richtlijnen werden gevonden, vooral met betrekking tot socio-emotionele en patiënt participatie items, die niet terug te vinden waren in de richtlijnen. Overeenkomsten tussen het Delphi onderzoek en www.mrsa-net.nl waren veel groter, wellicht doordat zij beide gericht zijn op het informeren van burgers. De experts bereikten consensus over relatief weinig informatiebronnen. Al die informatie bronnen vereisen dat burgers actief op zoek gaan naar informatie. Echter, omdat het bewustzijn beperkt is, zou een interactieve informatie applicatie moeten worden ontwikkeld die toegepast kan worden via ePanels. Het EPECS ePanel in zijn huidige vorm kent generaliseerbaarheid problemen en zou verder ontwikkeld moeten worden voor het gebruikt kan worden voor deze doeleinden.

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1. Introduction

1.1 Background

Methicillin Resistant Staphylococcus Aureus (MRSA) is a major cause of healthcare associated infections (Eveillard et al., 2006). Prevalence of MRSA in the Netherlands is among the lowest of the world, presumably due to the Dutch *Search and Destroy* policy and the prudent use of antibiotics in healthcare (Wertheim et al., 2004). Due to increasing cross border healthcare, the Dutch healthcare system is confronted with patients and healthcare workers (HCWs) from adjacent countries. MRSA prevalence in these countries is much higher than in the Netherlands. The European Antimicrobial Resistance Surveillance (EARSS) has shown that the prevalence of MRSA among clinical S. aureus isolates is below 1% in the Netherlands but is 28% in Belgium, 33% in France and 19% in Germany (Wertheim, et al., 2004).

Prior research has shown that involvement of stakeholders is crucial in the implementation of interventions aimed at reducing (the spread of) MRSA (Wentzel, Jong, Karreman, & Gemert-Pijnen, In press) and in the development in Antibiotic Stewardship Programs (Ewering, 2011). Patients are an important stakeholder in the prevention of cross-border transmission of MRSA; after all, they are the ones undergoing most infection prevention and –control measures. To enable effective patient participation, people must be well aware of (prevention of) MRSA and the risks of antibiotics use. Everybody can at any time become a patient. Therefore it is important that information is available for the entire general public, so they can participate in infection prevention and –control. Endless amounts of information are available on the internet and could be used in education, but its success depends on efficiently providing the most relevant information.

Goal of this study is to develop a scientifically validated item list, which can be used in the ePanel to measure the Euregion-citizens' perception of MRSA and antibiotics use, as well as their information needs (both social and cognitive) and where they get or want to get their information from. This will be done by using the case of the recently founded ePanel of the European Patients Empowerment for Customized Solutions (EPECS) foundation. Every member of the Dutch, German, Belgian, Luxembourg's or French general public can participate in this panel.

1.2 Problem Statement

Well informed and cooperative citizens are a necessity for the prevention and control of cross-border transmission of MRSA-bacteria between patients in the Euregion. It is still largely unknown what perception the general public has of MRSA and antibiotic stewardship. To measure these perceptions, it must be known what information they need and in what way they tend to search for this information. To the best of the author's knowledge, this has never been studied before.

1.3 Research Questions

The above described problem statement led to a main research question and two sub-questions that are answered in this study.

Main research question

How can the general public structurally and reliably participate in infection prevention and control in a cross-border setting via an ePanel?

To answer this research question two things are studied. First of all it must be studied what knowledge on MRSA and antibiotic use and what skills are necessary to enable participation. These knowledge and skills must be used as input for research via an ePanel. Thus, the second part of this study focuses on how an ePanel should be organized. Therefore two sub-research questions are formulated in this study.

Sub-question 1: Knowledge and skills

- What knowledge on MRSA and antibiotic use and what skills does the general public need to enable participation in infection prevention and –control in a cross-border setting?
- What are implications of the results for infection prevention and –control education and guidelines?
  - Do different stakeholder groups agree with the other stakeholder groups?
  - What are gaps between the opinions of stakeholder groups and existing guidelines and mrsa-net?

Sub-question 2: Participation via an ePanel

- What is the definition of an ePanel?
- How should an ePanel be organized/set up to ensure that it is representative of the general public?
  - What factors associated with recruitment influence the panel's scientific quality?
    - Who should be represented in the ePanel
    - Should participants in the ePanel receive financial compensation?
    - How should participants be recruited?
  - What factors associated with data collection influence the ePanel's scientific quality?
  - What factors associated with data analysis influence the ePanel's scientific quality?
  - What study methods can be applied to ePanels (focusgroup, survey etc)?
- Case: How is the general public currently participating in EPECS' ePanel?
  - How are the members of EPECS' ePanel for MRSA recruited?
  - What is the goal of EPECS' ePanel for MRSA?
  - Who participate in EPECS' ePanel for MRSA?
  - How does EPECS' ePanel for MRSA function?

1.4 Research Goals

Primary goal of this study is to provide a scientifically validated instrument which can be applied to an ePanel to measure the general public's knowledge and information needs. Based on the instrument, tools can be developed that stimulate and enable the general public to actively participate in infection prevention and control in cross-border settings. These tools can then be made to fit the information and knowledge need of the general public. An additional goal of this study is to provide recommendations on how to gain the most scientific worth from an ePanel (in the sense of representativeness and reliability of results).

2. Methods

First of all a Delphi study was performed to determine what knowledge on MRSA and antibiotics use and what skills are needed to enable patient participation. The results of this Delphi where compared with existing national guidelines. Then a literature study was performed on the organization and scientific value of ePanels. Finally an interview was done to describe the case of EPECS' ePanel.

2.1 Delphi Study

The Delphi method is deemed an appropriate research method when a problem does not lend itself to precise analytical techniques but can benefit from subjective judgments (Linstone & Turoff, 1975). Maduro has summarized a comparison of 'traditional' survey studies and Delphi studies. This comparison is given in Appendix A. Since its introduction, researchers have developed variations of the Delphi method. However according to Linstone and Turoff an acceptable broad definition of the Delphi technique can be formulated (Linstone & Turoff, 1975):

> Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem. To accomplish this "structured communication" there is provided: Some feedback of individual contributions of information and knowledge; some assessment of the group judgment or view; some opportunity for individuals to revise views; and some degree of anonymity for the individual responses.

2.1.1 Participants

The recommended number of people that should participate in the Delphi varies over different studies. Linstone and Turoff (Linstone & Turoff, 1975) suggest that a minimum of four to seven members should be involved. Delbecq et al however, claim that 10-15 members are needed to make up a homogenous group (Delbecq, Ven, & Gustafson, 1975). Overall it seems that Delphi studies should not be large, since it would generate a large data set, with little new information (Delbecq, et al., 1975). In general it is assumed that in qualitative research a group of five people is sufficient to determine 97% of all possible problems.

For this study there were several relevant expert groups: Infection Control Professionals, Clinical Microbiologists, Public Health Services (GGD) employees and MRSA-patients. MRSA-patients were contacted via an online forum. Other potential participants were contacted via e-mail. They were informed of the study and requested to participate. A total of four clinical microbiologists, six infection control professionals, six public health service employees and six MRSA-patients agreed to participate.

2.1.2 Materials

Respondents received an e-mail with a link to the first of three online surveys that were developed in SurveyMonkey (www.surveymonkey.com). To perform the Delphi procedure, first of all a list of items was developed based on existing literature on perception and knowledge of general public, patient visitors and/or patients about MRSA and antibiotic resistance (see also Appendices B & C, §3.1 and §3.2).

2.1.3 Procedure

The invitation e-mail, instructions and questionnaire were tested for wording and understanding by a communication expert. Then, reliability of the questionnaire was pilot tested among a convenience sample of seven members of the general public. After some textual changes, it was sent to the respondents.

After each round, data were analyzed and summarized using SPSS 18. Participants were then given feedback about the previous round. Time between two questionnaires was 32 and 31 days. In round two, the degree of (dis-)agreement from round one on the items that were included based on the literature study was given, followed by the same item, which participants then had to rescore. Furthermore, they were asked to provide the argumentation for their choice. For the items that participants suggested in addition to the existing ones, they were first grouped together when the same was said but in other words. Then both the grouped and unique suggestions were reported back and participants were asked to score them in the same way the items in round one were scored. In the final round, both the scores of round two and argumentations that were given

were reported back to the participants. In light of these scores, participants were asked to score the items one last time after which the results were analyzed for degree of consensus. As was done in a study by Maduro (2004), individual answers remained anonymous to the group. In this manner, panel members could change their minds without losing face, which might be an obstacle in face-to-face discussions (Maduro, 2004). The entire procedure of the current Delphi Study is graphically represented in Figure 1.

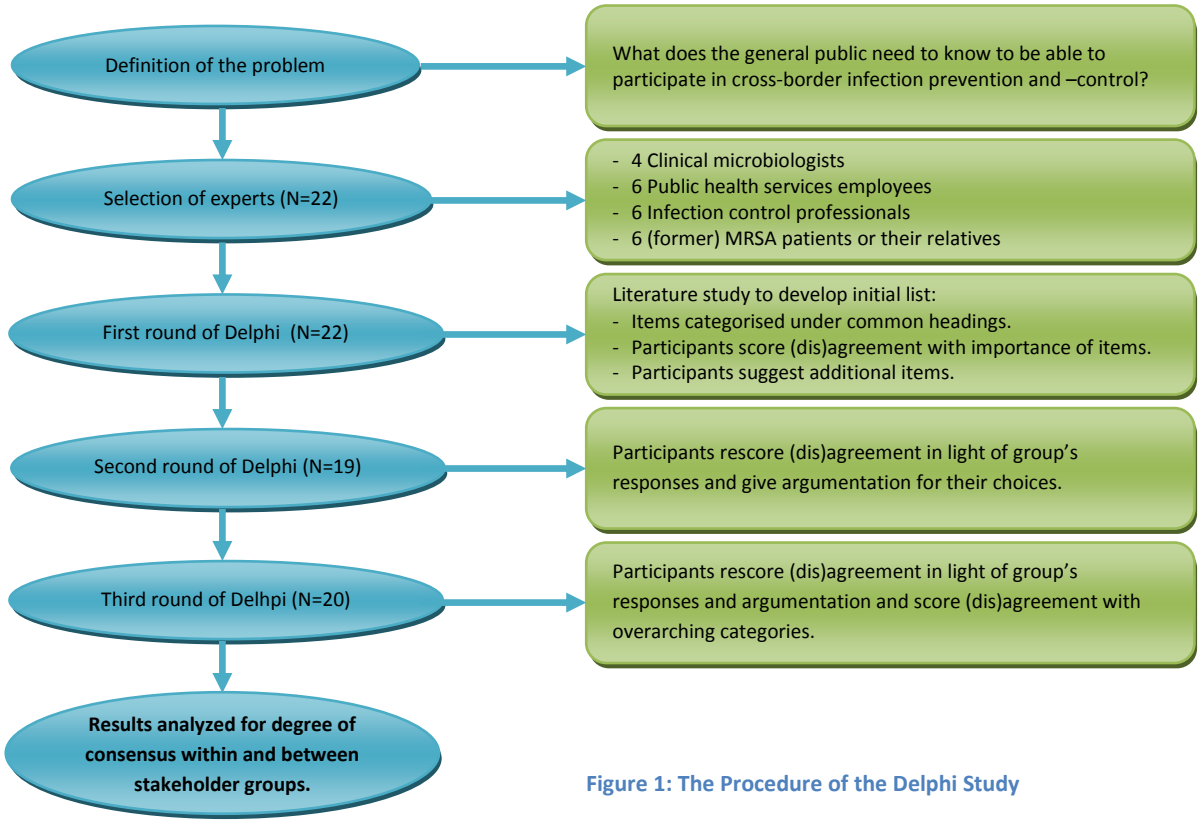

Figure 1: The Procedure of the Delphi Study

The number of participants in this study was rather small and the applied definition of when consensus is reached was quite strict. It is possible that respondents do not agree with a specific item but do agree with the underlying meaning. For example, people may not think it is important for the general public to know that 'bacteria can become resistant to antibiotics' specifically, but do think it is important for the general public to know something about the 'risks of antibiotics use' in general. Therefore, a card sort study was used to divide the individual items into overarching categories of knowledge that the general public should know something about. The card sort was performed by the author and another researcher (see Figure 2). Then, in round three of the Delphi, respondents were asked to also rate their agreement on these overarching categories.

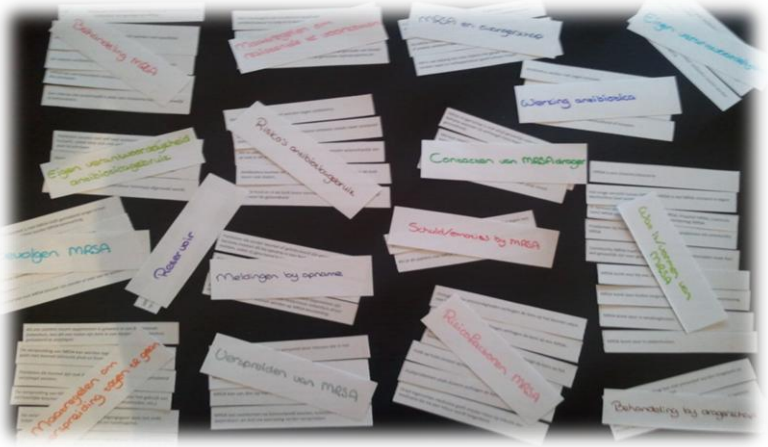

Figure 2: Card Sort to define overarching categories.

2.1.4 Data analysis

To determine when consensus is reached, different criteria have been used in literature (Avouac et al., 2009; Mokkink et al., 2010; Nikolaus, Bode, Taal, & Vd Laar, 2011). Based on these examples and the desire to provide high standard scientific evidence for the items, it was decided to use an 'all but one' criterion of selection. This means all but one participant must score an item as *important* or *very important* for it to be included (with n=22 this would be about 95,5% of the respondents). Items that did reach this score were included in the final item list and were removed from the following surveys. Items were excluded from the final item list when all but one of participants scored an item as *very unimportant* or *unimportant*.

2.2 Comparing Delphi Results with National Guidelines

Goal of the Delphi study was to determine what knowledge on MRSA and antibiotic use and what skills are important for the general public. These results in itself may not have much meaning. It is relevant to study what the results of the Delphi mean for infection prevention and –control education and guidelines. To do so, the Delphi results are compared with existing national MRSA and antibiotic use guidelines. In the Netherlands, there are three institutions that have developed national guidelines that should be included in this comparison: National Coordination Infections (LCI: Landelijke Coördinatie Infectieziekten), Workgroup infection prevention (WIP: Werkgroep Infectiepreventie) and Foundation Workgroup Antibiotics policy (SWAB: Stichting Werkgroep Antibioticabeleid). As opposed to the Delphi study, the national guidelines are all aimed at healthcare workers. To also make a comparison with a national tool that is aimed at the general public, the Delphi results are also compared with the website www.mrsa-net.nl. The comparisons are done on the level of the overarching categories.

2.3 Literature Study on ePanels

A literature study was performed on how ePanels should be designed and managed, to serve as a structural platform for patient participation whilst generating scientific data. Literature was searched to find what information is needed from the participants and who should participate, to make the ePanel scientifically valid. Title, keywords and abstracts were searched for: ["web panel*" OR "internet panel*" OR "online panel*" OR "e-panel*"]. Online databases that were used for the search are Science Direct and Scopus (in November-December 2011).

2.4 Interview with One of the Founders of EPECS

To illustrate the use of an ePanel, the EPECS ePanel is described. This is done via an interview with one of the founders of EPECS. Questions that where asked in the interview where based on the literature study on the organization and scientific value of ePanels. The entire interview was, with permission, recorded and transcribed verbatim to allow for the most accurate reporting. The resulting report was send back to the EPECS founder to check its accuracy.

3. Theoretical Framework

This theoretical framework consists of seven separate subjects. First and second part of the theoretical framework consists of the literature study on MRSA and antibiotic use that is used as input for the Delphi study. Third, the existing national guidelines that the Delphi results are compared with are briefly described. Fourth, literature on the importance of and conditions to enable patient participation are discussed. Fifth part of the theoretical framework consists of the description of a new form of patient participation: the ePanel. Literature on the organization of an ePanel is described. Sixth, the scientific value of ePanels is studied. Finally, as the seventh part of the theoretical framework, EPECS is briefly described.

3.1 MRSA Constructs

A total of seven studies on the general public's or patients' perceptions of Healthcare Associated Infections in general and MRSA specifically are included in this literature study (Bosma, 2007; Gill, Kumar, Todd, & Wiskin, 2006; Gould, Drey, Millar, Wilks, & Chamney, 2009; Hamour, O'Bichere, Peters, & McDonald, 2003; Mattner, Mattner, Zhang, & Gastmeier, 2006; McGuckin, Waterman, & Shubin, 2006; McLaughlin et al., 2008). In this paragraph literature on MRSA constructs will be discussed. This literature is used as input for the Delphi study. A list of items that are used as input in the Delphi is given in Appendix B.

3.1.1 MRSA in general

Literature on MRSA awareness differs greatly in the amount of knowledge measured. Whereas Hamour et al found that only 68% of questioned patients had heard of either 'superbugs' or MRSA, Gill et al found this percentage to be as high as 94% among patients and visitors (Gill, et al., 2006; Hamour, et al., 2003). At the same time research has shown that many misconceptions about what MRSA is exist among the general public (Bosma, 2007). It seems natural that a good conception of what MRSA is, would be a prerequisite of effective patient participation in prevention (of the spread) of MRSA.

3.1.2 MRSA-colonization versus infection

Few studies pay attention to the differentiation between MRSA-colonization and infection. One study that did focus on this found that only 48,5% of Dutch people where aware of the fact that one can be MRSA-carrier without becoming ill (Bosma, 2007). Another study found that 72% of the questioned public was aware of the difference between colonization and infection (McLaughlin, et al., 2008). Alarmingly, awareness of this risk for spread of MRSA was poor among patients' visitors in this study. Only 59.8% of this group was aware of the risk of MRSA-carriage (McLaughlin, et al., 2008).

3.1.3 Prevention of MRSA

Prevention of MRSA is a central topic in this study. There are relatively many preventive measures that are considered in literature. First of all, patients that have been admitted to a hospital outside the Netherlands must report this immediately so they can be tested for MRSA-carriage (Gezondheidsraad, 2006). These patients will often be treated in isolation (Coia et al., 2006). In one study 50,2% of the general Dutch public was aware of this preventive measure (Bosma, 2007). In the Netherlands people who work with cattle or have been colonized or infected with MRSA before, also must report so upon admittance since they need to be screened immediately (Coia, et al., 2006; Gezondheidsraad, 2006). This is important since awareness of a MRSA-colonization is a first step toward applying adequate preventive measures.

One widely used and important preventive measure is strict application of disinfection measures and hand hygiene (Coia, et al., 2006; Finch, Metlay, Davey, & Baker, 2004; Joffe, Washer, & Solberg, 2011; McGuckin, et al., 2006). In one study only 33,8% of the Dutch general public was aware of the great importance of good hygiene in the prevention of MRSA (Bosma, 2007). In other studies respectively 54% and 92% of questioned patients thought hand washing is important in preventing spread of MRSA (Hamour, et al., 2003; McLaughlin, et al., 2008). In the study by McLaughlin et al, the general public and visitors where slightly less (81,2% and 86,1% resp.) aware of the importance of hand hygiene (McLaughlin, et al., 2008).

Literature shows that also environmental hygiene is important in controlling MRSA (Coia, et al., 2006; Loveday, Pellowe, Jones, & Pratt, 2006). MRSA can survive in dust (Coia, et al., 2006). The general public also

considers the environment as a major source of contamination. The environment can, according to them, be hospital equipment (e.g. medical equipment) and locations (e.g. floors, bathrooms) (Joffe, et al., 2011). In one study almost all respondents associated MRSA with dirty hospitals (Washer, Joffe, & Solberg, 2008). Therefore, in another study, most representatives of the general public (94%) considered environmental hygiene as very important (McGuckin, et al., 2006). Only one study is found that also considers (clinical) waste and linens management to be an important part of infection prevention and –control (Coia, et al., 2006).

Once patients are known to be infected or colonized by MRSA, they should be treated in isolation to prevent further spread (Coia, et al., 2006). Only slightly more than half (59%) of the general Dutch public in one study was aware of this fact and 23% answered 'don't know' (Bosma, 2007). Infected patients should only be treated by staff who are wearing personal protective equipment, such as gloves, gowns and aprons (Coia, et al., 2006; Joffe, et al., 2011). This also goes for visitors who assist with the patient's bodily care. Visitors who only have social contact with the patient are not obligated to do so (Coia, et al., 2006). In one study 42% of questioned patients thought this could help prevent transmission (Hamour, et al., 2003).

3.1.4 Reservoirs of MRSA

Patients can be colonized with MRSA in blood, mucous membranes (such as nose and throat), hair and on the skin (Coia, et al., 2006). In one study the general Dutch public appeared to be largely unaware of these reservoirs. Still 39% of respondents knew MRSA could be found in the blood and 29,3% of respondents knew MRSA could be found in mucous membranes (Bosma, 2007). But only 16% and 6% of respondents were aware of the possibility of MRSA-carriage on the skin and in the hair respectively (Bosma, 2007).

3.1.5 Spread of MRSA

As stated before, MRSA can spread through people touching floors, toilets or medical equipment (Joffe, et al., 2011). In the study by Bosma, it was found that 48% of the Dutch general public was aware of the risk of spreading MRSA through the environment (Bosma, 2007). Furthermore, MRSA can spread through skin-to-skin contact (EPECS, 2011; Joffe, et al., 2011). A total of 41% of the Dutch general public is aware of this (Bosma, 2007). Another means of spread of MRSA is from animal to human (Graveland, Duim, van Duijkeren, Heederik, & Wagenaar, 2011; Leonard & Markey, 2008). Only 21% of the Dutch general public was aware of this route of spread (Bosma, 2007). A final means of spread is through people that have been abroad (Bosma, 2007; Joffe, et al., 2011).

3.1.6 Consequences of MRSA

Although Hamour et al showed most patients were aware of possible consequences of a MRSA-infection, still 8% of questioned patients thought there were no consequences of infection (Hamour, et al., 2003). Patients that are colonized with MRSA may develop an infection (Coia, et al., 2006). One study questioning patients found that 46% was aware of the risk of developing wound infections (Hamour, et al., 2003). Within the general Dutch public this awareness was slightly higher, whit 72% of respondents reporting that MRSA may cause an infection (Bosma, 2007). As a result of such an infection, patients are at a higher risk of mortality (Coia, et al., 2006). Further consequence of an MRSA-infection is delayed discharge. A total of 68% of the Dutch general public is aware of this (Bosma, 2007) but in another study (in the UK) only 22% of questioned patients knew about it (Hamour, et al., 2003).

3.1.7 Risk factors for MRSA

As mentioned before, lack of hygiene is an important risk factor for the spread of MRSA (Joffe, et al., 2011). Of the Dutch general public, 64% was aware of this (Bosma, 2007). Also recent hospitalization abroad is a risk factor (Coia, et al., 2006), which half of the Dutch general public was aware of (Bosma, 2007). Different aspects of the skin are other risk factors. First of all wounds (Coia, et al., 2006), which a little over half (56%) of the people are aware of (Bosma, 2007). Secondly skin problems such as eczema (Coia, et al., 2006), which is poorly known among the Dutch public (14%) (Bosma, 2007). Finally skin-to-skin contact in general poses increased risks of spread (Coia, et al., 2006). This is known by almost 30% of the Dutch general public (Bosma, 2007).

3.1.8 Origins of MRSA

Naturally, MRSA is prevalent in hospital environments (EPECS, 2011; McLaughlin, et al., 2008) and most (70-84%) people are aware of this (Bosma, 2007; Hamour, et al., 2003). It is less known (51%) that MRSA could also be contracted in nursing homes (Bosma, 2007). Also, MRSA can be found among the general population (EPECS, 2011; McLaughlin, et al., 2008), this is known by 44-62% of respondents (Bosma, 2007; Hamour, et al., 2003). Finally, MRSA can be found among livestock such as pigs and calves (Graveland, et al., 2011; Leonard & Markey, 2008). This is known by only 22% of the Dutch general public (Bosma, 2007).

3.1.9 Treatment of MRSA

Early treatment of MRSA-colonization reduces the amount of infections and mortality caused by MRSA (Coia, et al., 2006). This is known by 53% of the Dutch general public (Bosma, 2007). Most antibiotics do not work for the treatment of MRSA (EPECS, 2011), a MRSA-infection can only be treated by some specific antibiotics (McLaughlin, et al., 2008). This is known by only 48% of the Dutch general public (Bosma, 2007).

3.2 Antibiotic Stewardship Constructs

A total of five articles examining the perceptions the general public or patients have about (prudent) antibiotic use are included in the literature study (Belongia, Naimi, Gale, & Besser, 2002; Chan et al., 2011; Ewering, 2011; Finch, et al., 2004; McNulty, Boyle, Nichols, Clappison, & Davey, 2007). In this paragraph literature on ASP constructs will be discussed. This literature is used as input for the Delphi study. A list of items that are used as input in the Delphi is given in Appendix C.

3.2.1 Antibiotic resistance

Literature shows that some people (16%) are unaware that bacteria are becoming resistant to antibiotics (McNulty, et al., 2007). Several studies claim this should also be part of educational campaigns (Coia, et al., 2006; Finch, et al., 2004). Furthermore, when antibiotics are prescribed to often or dosages are too large, it is less likely they will continue to work well in the future (Karreman, Gemert-Pijnen, Limburg, Wentzel, & Hendrix, n.d.). Fortunately, 92% of respondents in a study was aware of this danger (McNulty, et al., 2007).

Most people (97%) are aware that anyone, including themselves, could get infected with antibiotic resistant bacteria (McNulty, et al., 2007). Once an infection has emerged, caused by resistant bacteria, these are difficult to treat (Acar, 1997; Karreman, et al., n.d.). Possible explanations for this difference is that much less people (only 53% and 54% resp.) are aware that resistant strains can emerge due to not finishing the whole course (Chan, et al., 2011; McLaughlin, et al., 2008).

3.2.2 Antibiotic use

Literature shows that almost all people (87% and 97% resp.) in different studies know it is important to finish a whole course of antibiotics prescription (Chan, et al., 2011; McNulty, et al., 2007). Still, only 76% of the people that had been prescribed antibiotics in the past two years had finished their course (Chan, et al., 2011).

Unfortunately only 57% of questioned people in another study knew antibiotics do not work against viruses, and 68% knew antibiotics do not work against coughs and colds (McNulty, et al., 2007). Even more surprising is that in the same study 20% of participants did not think antibiotics could kill bacteria (McNulty, et al., 2007). This is even though most educational campaigns to improve antibiotic use in the community have stressed the difference between viral and bacterial infections (Finch, et al., 2004; Karreman, et al., n.d.).

Furthermore, people seem to have trouble realizing the value of their normal flora. When asked whether bacteria that normally live on the skin and in the gut are good for one's health, only 58% of respondents agreed (McNulty, et al., 2007). The concept that antibiotics also kill these healthy bacteria seems hard to grasp, only 57% of respondents agreed (McNulty, et al., 2007). This is a shame since the combination of these factors is what gives resistant bacteria room to multiply and spread (Karreman, et al., n.d.). To limit this spread, literature shows that it is important to use as little as possible broad-spectrum antibiotics (especially third generation cephalosporins and fluroquinolones) and that a course of antibiotics should be of adequate duration (Coia, et al., 2006). Finally, it is known that antibiotics are used in animal feed, to prevent illness. This causes the risk of emergence of antibiotic resistant bacteria to become even higher (Barton, 2000; Feinman, 1998).

3.3 National Guidelines on MRSA and Antibiotic Use

In the Netherlands, three institutions have developed national guidelines for S. Aureus in general and MRSA specifically. These are National Coordination Infections (LCI: Landelijke Coördinatie Infectieziekten), Workgroup infection prevention (WIP: Werkgroep Infectiepreventie) and Foundation Workgroup Antibiotics policy (SWAB: Stichting Werkgroep Antibioticabeleid) (LCI, 2011; SWAB, 2007; WIP, 2008). The LCI guidelines are mainly developed for employees who are involved in infection prevention and –control in health service organizations. The WIP and SWAB guidelines are aimed at patients and employees of hospitals. The SWAB guideline aims at antibiotics use in adults in hospitals. Dutch hospitals base their protocols on the WIP and SWAB guidelines. Despite the availability of these three guidelines, prior research and the current study have shown that a translation of the clinical and technical information in the guidelines into understandable information for the general public and patients is needed. This is why the MRSA-net project developed the website www.mrsa-net.nl (Verhoeven et al., 2008; Wentzel, Karreman, & Gemert-Pijnen, 2011). This website can be used by both professionals and the general public to gather information on MRSA.

3.4 Patient Participation

Patients are more and more involved in health care. According to the World Health Organization this is not only desirable but a social, economic and technical necessity (Waterworth & Luker, 1990). The term used to describe this involvement is 'patient participation'. Many definitions of the term 'patient participation' exist (Cahill, 1998). One of these definitions states that patient participation is "the activities performed by an individual on behalf of others in the maintenance and promotion of health, the prevention of diseases, detection, treatment and care of illness and the restoration of health, or, if recovery is not possible adaption to continuity of disability" (McEwen, Martini, & Wilkins, 1983). Research has suggested that when patients are involved (or 'participating') in their own healthcare, this will help improve the quality of care (Grol, 2001).

Effective (patient) participation is only possible when patients are well informed and have the necessary knowledge (correct perception) about the topic being discussed. Furthermore, they must be willing and able to be involved (Polat, 2005; Smith, 2003). Besides the knowledge people have, emphasis must also be placed on obtaining the necessary information and being able to interpret it. It is therefore insufficient to just measure knowledge. Prior studies aiming at measuring perception have focused on knowledge and sources of information (Bosma, 2007; Hamour, et al., 2003).

In the case of infection prevention and –control, knowledge is considered a precondition for preventing spread (Mattner, et al., 2006). Especially for infection prevention and –control, this may induce problems. To acquire information and knowledge on infection prevention and –control, patients would logically have to turn to their nurses or doctors. However, research shows patients may often feel uncomfortable approaching staff with questions about (hospital) infections or comments on hygiene (Burnett et al., 2010; Grol, 2001; Lent et al., 2009). Alternative sources of information have been developed. Specifically through the internet, which has given rise to an information revolution: Consumers gain free access to an enormous volume of information (Jadad & Gagliardi, 1998). Examples of such informative websites are www.mrsa-net.nl and www.antibioticstewardship.nl, developed within the MRSA-net and EurSafety Health-net projects (Verhoeven, et al., 2008; Wentzel, et al., 2011).

3.4.1 eParticipation

One form of patient participation is eParticipation, this is the use of information and communication technology (ICT) for patient participation (Sanford & Rose, 2007). The internet, as a form of ICT, may contribute to increased participation because it enables easier access to a high volume of information (Polat, 2005). The number of individuals who have access to the internet is still growing, so the pool of internet users from which research can sample is increasing (Liu et al., 2010). For example, in 2011 95% of Dutch people had access to the internet (CBS, 2011). Thus, increasingly many studies use internet data collection (IDC) (Liu, et al., 2010).

IDC's advantages can be described by three overarching categories: The participative imperative, instrumental justification and technology focus (Sanford & Rose, 2007). According to the participative imperative stakeholders have a right to participate in decisions that involve their interests. The use of IDC

enables large groups of people to participate in decision making. The instrumental justification can be found in the assumption that involvement of stakeholders in decision making can result in more effective policy, through improved adoption and implementation. The use of IDC enables many people to participate and therefore creates a large support base. The technology focus concerns the advantages of using ICT or the internet, such as a greater reach (Sanford & Rose, 2007).

3.5 A New Method of eParticipation: The ePanel

Based on the articles that were found in the literature study, the rather new research method of ePanels is described in the following paragraphs. After elimination of irrelevant articles a total of nine articles were deemed appropriate for use in this paper (Baker et al., 2010; Batinic, Reips, Bosnjak, & Werner, 2000; Brüggen & Dholakia, 2010; Daugherty, Lee, Gangadharbatla, Kim, & Outhavong, 2005; Dennis, 2001; Göritz, 2004a, 2004b; Liu, et al., 2010; Sanford & Rose, 2007). These articles were then complemented with articles on adjacent topics (such as online research in general).

Within the field of marketing research a brand new method to enable eParticipation has emerged (Daugherty, et al., 2005). This new method consists of a virtual community of people who have agreed to provide information and is established primarily by organizations seeking opinions and knowledge on any number of topics (Daugherty, et al., 2005; Brüggen & Dholakia, 2010). Or, as Dennis states ePanels consist of "individuals who are pre-recruited to participate on a more or less predictable basis in surveys over a period of time" (Dennis, 2001). The definition of an ePanel that will be used in this study, based on literature, is: "An ePanel is an online virtual community, which consists of pre-recruited individuals, with the goal of allowing them to easily participate in the measurement of knowledge or attitudes on any number of topics, via online research methods".

This rather broad definition of an ePanel allows different types of ePanels to exist. As can be seen in Figure 3, ePanels are characterized by a few factors, which are: The recruitment strategy, the stability of membership, the amount of interaction between members and the homogeneity of members. These characteristics are each discussed in the following paragraphs.

An increasing amount of organizations (corporate, non-profit and governmental) recognize the benefits of ePanels for the study of and communication with their publics (Daugherty, et al., 2005). Online panels may reduce the cost associated with locating appropriate respondents and ensure their continued availability (Göritz, 2004a). Additional benefits are easy identification of key sample segments, increased response, shorter field times and ethical advantages in research (Dennis, 2001; Göritz, 2004a). Also, cross-referencing data enables researchers to validate data and to avoid asking redundant questions over and over again (Daugherty, et al., 2005; Göritz, 2004a).

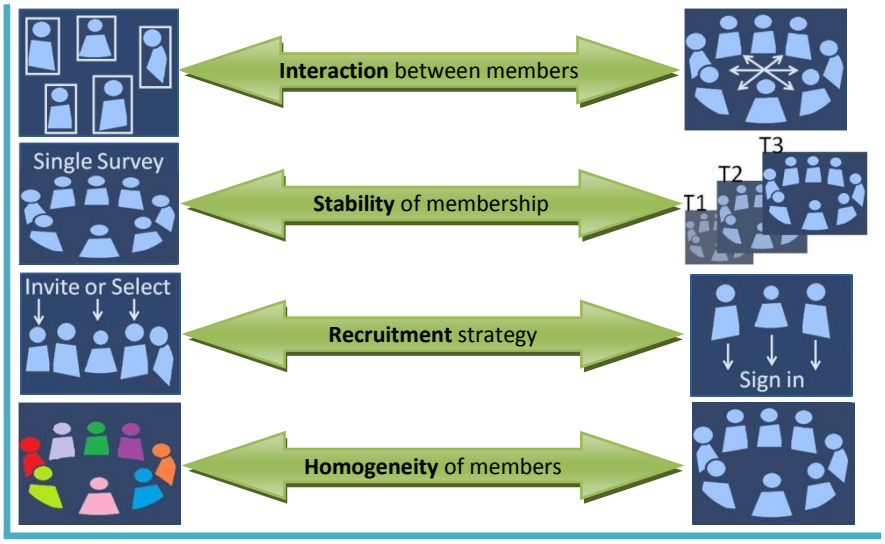

Figure 3: Factors that characterize an ePanel

3.5.1 Recruitment of panel members

An ePanel may exist in various forms, based on different recruitment methods (Baker, et al., 2010; Göritz, 2004b). The most common and well known type of ePanel uses nonprobability-based recruitment. Members for these panels are pre-recruited through for example banner ads, e-mail invitations etc (Göritz, 2004b). Possibilities to join the panel are shown to potential panel members. The panel is constructed by an organization. People can join the panel by visiting this organization's website (Daugherty, et al., 2005). Some offer extrinsic incentives for joining (Baker, et al., 2010; Daugherty, et al., 2005). These incentives may also be intrinsic, for example by assuring members that their opinions make a difference (Daugherty, et al., 2005). Research has shown that members of online panels often indeed participate for reasons other than material incentives (Göritz, 2004a). For instance, they may participate to be able to gain information (knowledge functional source), to express self-concepts or values (value-expressive functional source) or to feel part of a community (Daugherty, et al., 2005).

Another type of ePanel does use probability-based methods for recruitment of panel members (Baker, et al., 2010). An example of such recruitment method is Random Digit Dialing (RDD). This implies that random phone numbers are called by the organization constructing the panel and people who answer are invited to join the panel (Baker, et al., 2010). Generally this type of ePanel has fewer members than the panels with nonprobability-based recruitment strategies.

In general, literature shows that knowledge and value-expressive functional sources serve as strong contributors to attitudes formulated about ePanels (Daugherty, et al., 2005). The knowledge function of an attitude recognizes that people are driven by the need to gain information. This is also referred to as the 'need for cognition' (Brüggen & Dholakia, 2010; Daugherty, et al., 2005; Galesic & Bosnjak, 2006). The value-expressive function is served by attitudes that allow individuals to express their self-concepts or values (Daugherty, et al., 2005).

3.5.2 Stability of membership

Another factor that characterizes ePanels is the stability of panel membership (Sanford & Rose, 2007). Whereas members of one panel type usually only remain members for the study of one single topic, members of other types of ePanels typically remain in the panel for a longer period of time. The latter type of ePanel is more common. In the first type of ePanel, members participate in a single survey or topic (Baker, et al., 2010). After participating in one topic, respondents are sometimes asked to join an ePanel, but this is not always the case (Baker, et al., 2010). Online discussion forums are an example of ePanels where participants typically are involved in a single discussion (Sanford & Rose, 2007). In the second type of ePanel, members are recruited with the aim of participating in multiple surveys or topics, often based on personal motivations (Daugherty, et al., 2005). This type of ePanel is for example used for the discussion of political topics in a citizen's panel (Sanford & Rose, 2007).

3.5.3 Interaction between panel members

This characteristic is derived from the before mentioned examples of ePanels. Most ePanels use online surveys (Brüggen & Dholakia, 2010). Naturally, in this type of ePanels, members only communicate with the research organization and there will be no interaction between panel members at all (Daugherty, et al., 2005). Other ePanels however, use online discussion forums, where interaction between panel members is at the core of activities (Sanford & Rose, 2007).

3.5.4 Homogeneity of panel members

A final characteristic based on which types of ePanels can be set apart is the degree of homogeneity of panel members. Hardly any literature is found on this subject, but it seems very relevant nevertheless. By randomly selecting panel members from the general public, the selected group of participants will likely be more heterogeneous, like 'real world' populations (Baker, et al., 2010). In other cases ePanels are purposely designed to only involve members with certain characteristics, for example in the case of hard to reach populations or people with a rare condition.

Research has shown that in group decision making, heterogeneous groups are more creative than homogeneous groups (Okoli & Pawlowski, 2004). Moreover, heterogeneous groups are known to produce more high quality and acceptable solutions than homogeneous groups (Delbecq, et al., 1975; Powell, 2003). However, it seems clear that homogeneous panels have less trouble reaching consensus (Linstone & Turoff, 1975).

3.6 Scientific Value of ePanels

Hardly any research has been performed on the scientific value of ePanels (Göritz, 2004a). Findings in this chapter are not only based on literature on ePanels, but also on literature on online surveys, since the threats to the scientific value of online surveys are rather similar to the threats to the scientific value of ePanels.

Overall it is assumed that the scientific value of any research method is determined by its reliability (will a particular technique, applied repeatedly to the same object, yield the same results each time), internal validity (the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration) and external validity (will the results still hold true when they are generalized to the entire target population) (Babbie, 2004).

The most relevant threat to the scientific value of online data collection in general (Zimmerman, Atwood, & Cupp, 2006) and ePanels specifically is the external validity or 'generalizability' of its results (Baker, et al., 2010; Liu, et al., 2010). This threat arises when the panel members differ from the target population on relevant characteristics. Several forms of bias may cause a lower generalizability. These are briefly described in this paragraph. Some of them may also influence the ePanel's validity and/or reliability.

One of the most important limitations of ePanels is non-response (Brüggen & Dholakia, 2010). Response rates are so important since the greater the response the more likely it is that the study will accurately estimate the parameters of the population sampled (Batinic, et al., 2000). Non-response can emerge in several stages of the panel. People who are asked to participate may (1) refuse to participate at all, (2) omit some items during a survey but fully complete it or (3) refuse to participate in further surveys within the panel (Brüggen & Dholakia, 2010; Galesic & Bosnjak, 2006; Marcus & Schütz, 2005). The different forms of non-response are discussed below.

3.6.1 Selection bias

Batinic et al state that an ePanel is at risk of inordinate selection bias (Batinic, et al., 2000). This form of bias simply means that those selected are not typical or representative of the larger population they have been chosen from (Babbie, 2004).

Little research has been performed on what separates respondents in ePanels from the non-respondents. This is no wonder, since it is per definition hard to reach the not participating subgroup (Brüggen & Dholakia, 2010). Nevertheless some research has been undertaken to examine differences between respondents and non-respondents, specifically focusing on differences in personality traits (Galesic & Bosnjak, 2006; Rogelberg, Spitzmüeller, Little, & Reeve, 2006). However, these studies do not concern ePanels specifically, but online survey completion in general. Still, selection bias issues are considered to be similar, so that online survey issues can be generalized to ePanel member selection.

There are basically two types of non-respondents: Active non-respondents and passive non-respondents (Rogelberg et al., 2003). Passive non-response may have several causes, which have in common that non-response is not a conscious choice. First of all, inaccessibility may cause non-response. This may occur when an individual does not have internet access. Secondly, inability may cause non-response. This may occur when an individual is ill or an ePanel covers unfamiliar topics. Finally, carelessness may cause non-response. This may occur when an individual simply forgets to respond to an invitation to participate (Rogelberg & Luong, 1998). Active non-respondents make a conscious choice not to participate. This may occur when the covered topic is of no relevance to the individual or when he/she dislikes ePanels in general (Rogelberg, et al., 2003; Rogelberg & Luong, 1998).

Recruitment success also depends on the way people are approached, for example via phone, e-mail, fax, letter and flyer (Göritz, 2004b). However, also on this topic very little scientific literature is known. Göritz

compared e-mail (randomly drawn from online 'white pages'), fax, letter (drawn from public telephone directory) and flyers (distributed among passers-by on the street and laid out in public places) as recruitment strategies. The study concludes that overall, e-mail was the most successful recruitment strategy (with 21,6% of distributed e-mails resulting in a new panel member), followed by fax (4,2%), fliers (5,6%) and letters (1,0%). This study was performed in 2004, which may most likely mean these results would now be even more favorable toward e-mail. However, some bias may have been caused by the chosen recruitment strategy. Fax-recruited panelists were older then flyer-recruited and e-mail recruited panelists. E-mail recruited panelists had been using the internet for a longer period than flyer-recruited and fax-recruited panelists. Finally, e-mail recruited panelists use the internet more frequently than fax-recruited panelists (Göritz, 2004b).

3.6.2 Drop-out

Drop-out, or 'panel attrition', also threatens the external validity of ePanels. A differentiation can be made between temporary (wave drop-out) and a permanent drop-out (panel drop-out) (Batinic, et al., 2000). Furthermore, item non-response may occur, where respondents omit some specific items of a survey. Research has shown no relation between drop-out and recruitment strategy (Göritz, 2004b). In this one study there were no significant differences in number of omitted items or drop-outs between e-mail recruited, fax recruited, flier recruited or letter recruited (Göritz, 2004b). Researchers may try to limit drop-out by performing 'panel maintenance' (Batinic, et al., 2000). Panel maintenance can roughly be divided into three components: Motivation of respondents, tracking of straying participants and motivation of interviewers (Batinic, et al., 2000). Motivation of respondents may for instance be achieved by sending birthday of Christmas cards, brochures or other information on the study topic or incentives (see §3.3.5) (Batinic, et al., 2000).

3.6.3 Panel bias

Panel bias is a threat to internal validity that arises via a change of the behavior of respondents as a consequence of their participation in an ePanel (Batinic, et al., 2000). Or, as Dennis (2001) states in his research, the risk that ePanels are "creating professional respondents", which means ePanel members answer questions differently than those with little or no experience on a panel (Dennis, 2001). Behavior of ePanel members changes due to their awareness of being part of the panel (so called Hawthorne effect), repeated exposure to the survey topic and the interviewer, similar questions, and measures of panel maintenance (Batinic, et al., 2000). This may be an unconscious process, but it may also be so that respondents feel obligated to prepare for future surveys and take steps to increase their awareness and knowledge on the research topic (Dennis, 2001). Research suggests that, in order to minimize panel bias, long surveys should be avoided since they leave a lasting impression on the panel members. Also, a concentration of surveys on a particular topic should be limited (Dennis, 2001).

3.6.4 Data security

One of the greatest advantages of ePanels, may at the same time be a risk for its external validity. Through the use of ePanels, respondents can be asked about their personal data once. These can be stored by the ePanel coordinator. Data can then be cross-referenced to enable researchers to validate data and to avoid asking redundant questions over and over again (Daugherty, et al., 2005; Göritz, 2004a). However, this does pose a risk of reduced anonymity (Batinic, et al., 2000). This may not in itself be a disadvantage, but it may lead to non-response due to the growing awareness of individuals of privacy issues (Batinic, et al., 2000).

3.6.5 Incentives

Many ePanels offer material (extrinsic) incentives for participating (Göritz, 2004a). Although many (dis)advantages of offering material incentives are similar to those in offline research, some are different. Some people who access the internet from their home, might not have unlimited internet access and therefore have to pay for each online session (Batinic, et al., 2000). In 2011 this was still the case for 10% of all Dutch people (CBS, 2011). This implies they would also have to pay for participation in an ePanel. Therefore incentives may be necessary in such situation to counteract a bias toward respondents who have a free or flat-rate internet connection (Göritz, 2004a).

Another difference is that participation in online research compared to face-to-face studies is easier, more comfortable and less time consuming. This could suggest that incentives in ePanels may have less impact than in offline surveys (Göritz, 2004a). However, when panel members are asked to participate in multiple surveys this effect may be counteracted (Göritz, 2004a).

Incentives may pose a threat on both the internal and external validity of ePanel research. Very little scientific literature on incentives for ePanels is known. When a research organization does choose to offer incentives with the aim of increasing response rate or decreasing drop-out rate, it is best to offer bonus points (BPs) which could be redeemed against vouchers for online shops (a guaranteed incentive), rather than a lottery (Göritz, 2004a). However, attention must be given to the possible danger of attracting a certain population by choosing an incentive system. For example, the popularity of gift lottery is greater among elder respondents, the popularity of BPs is greater among more educated respondents (Göritz, 2004a). At the same time, researchers can also take advantage of such knowledge and tailor incentives to particular target groups (Göritz, 2004a).

Greater problems arise when the existence of incentives alters the participants' behavior. For instance, people may try filling out a survey many times or may rush through a survey to get to the incentive (Göritz, 2004a). Alarmingly, offering incentives is known to even drive away potential participants who are intrinsically motivated (Göritz, 2004a).

3.7 Case: European Patients Empowerment for Customized Solutions

Effective (patient) participation is only possible when people are well informed and have the necessary knowledge about the topic being discussed. Furthermore, they must be willing and able to be involved (Smith, 2003). The EPECS (European Patients Empowerment for Customized Solutions) foundation's goal is to involve citizens, and specifically patients, in (European) health care issues. Recently they have started recruiting citizens of the border region (Euregion) to participate in an ePanel. Through this ePanel EPECS, in cooperation with the EurSafety Health-net project, wants to gain insight in the knowledge and skills people have concerning MRSA and antibiotic stewardship. To be able to do so the ePanel should be a reliable representation of the general public and the used questionnaire should be (scientifically) validated. Furthermore, a clear view on what people should know must be created.

4. Results

4.1 Sub-Question 1: Knowledge and Skills

First part of the first sub-question was: What knowledge on MRSA and antibiotic use and what skills does the general public need to enable participation in infection prevention and –control in a cross-border setting? This question is answered through a Delhi study with three rounds. The results of each round and the final results are described. An overview of (the degree of) consensus among the entire group of respondents and within each subgroup of respondents in each round of the Delphi is given in Appendix D.

4.1.1 Delphi round one

A total of 22 respondents participated in the first round of the Delphi: four clinical microbiologists, six infection control professionals, six health service organization employees and six MRSA-patients. Applying the 'all but one' rule for consensus means 95% of respondents have to agree on an item. Input for this round of the Delphi consisted of 31 MRSA knowledge items and 14 ASP knowledge items. An overview of the evaluation of the knowledge items is given in Table 1 and Table 2. Consensus is reached in a total of 4 items (8,9%), three of which concern MRSA (9,7%) and 1 of which concerns antibiotic use (7,1%). Boxplots of the round 1 consensus items are given in Appendix F. The consensus items are considered important by the stakeholders:

- One can be colonized with MRSA without becoming ill.
- Patients who have recently been admitted to a hospital abroad, may be treated in isolation in a Dutch hospital.
- Patients who have recently been admitted to a hospital abroad must immediately report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- When too much antibiotics are used increasingly many resistant bacteria will develop.

Between groups. Within each subgroup of respondents more consensus was reached than overall. An overview of the degree of consensus of each subgroup is given in Table 1 and Table 2. To keep the table as clear as possible, the categories "*very unimportant* and *unimportant"* and "*important* and *very important"* are grouped together to create three possible scores: *unimportant*, *neutral* and *important*.

The clinical microbiologists agreed on 24 MRSA items (77,4%) and on seven ASP items (50,0%). Besides the items that all stakeholders agreed upon, they considered these items important on the five point Likert scale:

- MRSA is a hospital bacterium.
- Patients who work with livestock should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- The spread of MRSA can be limited via the use of personal protective equipment.
- MRSA-colonized patients must be treated in isolation in a hospital.
- MRSA can spread though skin-to-skin contact.
- MRSA can spread from animal to human.
- MRSA-colonization can lead to a MRSA infection.
- A patient who is colonized with MRSA on average stays longer in a hospital than a patient without MRSA-colonization.
- Wounds and other skin disorders increase the risk of a MRSA-infection.
- A recent hospitalization abroad increases the risk of a MRSA-infection.
- Skin-to-skin contact increases the risk of a MRSA-infection.
- Skin problems such as eczema increase the risk of a MRSA-infection.
- MRSA occurs in hospitals.
- MRSA occurs in nursing homes.
- MRSA occurs in livestock (such as pigs and calves).
- Timely treatment of MRSA decreases the risk of MRSA-infections and possibly death.
- A MRSA-infection can only be treated with specific antibiotics.
- Most antibiotics are ineffective against MRSA.
- As little broad-specter antibiotics should be used (especially third generation cephalosporins and floroquinolones).
- Antibiotics do not work against viruses.
- Antibiotics are prescribed preventively in stock farms, which increases the risk of development of resistant bacteria.
- Antibiotics can also destroy 'good' bacteria that live on the skin or in the stomach.

- If too much antibiotics are used, they are less likely to work as well in the future.
- An infection that is caused by a resistant bacterium is harder to treat.
- Bacteria can become resistant against antibiotics.

Clinical microbiologists considered one item neutrally important on the five point Likert scale:

- MRSA can occur in blood, mucous membranes (such as the nose and throat), and hair and on the skin.

Clinical microbiologists considered one item unimportant on the five point Likert scale:

- MRSA can be spread in the Netherlands via people who have been abroad.

The infection control professionals agreed on 15 MRSA items (48,4%) and on seven ASP items (50,0%). They rated most items as being important knowledge for the general public on the five point Likert scale. Besides the items that all stakeholders agreed on, the consensus items where:

- Patients who work with livestock should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- The spread of MRSA can be limited via strict application of disinfectant measures and hand hygiene.
- The spread of MRSA can be limited via the use of personal protective equipment.
- MRSA-colonized patients must be treated in isolation in a hospital.
- MRSA-colonization may cause an infection.
- A recent hospitalization abroad increases the risk of a MRSA-infection.
- Skin problems such as eczema increase the risk of a MRSA-infection.
- MRSA occurs in hospitals.
- MRSA occurs in nursing homes.
- MRSA occurs in livestock (such as pigs and calves).
- An antibiotics treatment should be finished completely.
- Antibiotics do not work against colds or coughs.
- If too much antibiotics are used, they are less likely to work as well in the future.
- An infection that is caused by a resistant bacterium is difficult to treat.
- Bacteria can become resistant against antibiotics.
- Anyone can become colonized with a resistant bacterium.

The public health services employees agreed on seven MRSA items (22,6%) and seven ASP items (50,0%). They rated most items as being important knowledge for the general public on the five point Likert scale. Besides the items that all stakeholders agreed on, the consensus items where:

- MRSA is a hospital bacterium.
- MRSA can spread through skin-to-skin contact.
- A recent hospitalization abroad increases the risk of MRSA-colonization.
- MRSA occurs in livestock (such as pigs and calves).
- An antibiotics treatment should completely be finished.
- Bacteria can become resistant against antibiotics.
- As little as possible broad-specter antibiotics should be used (such as third generation cephalosporins and floroquinolones).
- Antibiotics can kill the 'good' bacteria that live on the skin and in the gut.
- An infection that is caused by a resistant bacterium is difficult to treat.

Public health service employees considered one item neutrally important on the five point Likert scale:

- Antibiotics can kill bacteria.

The (former) MRSA-patients agreed on 29 MRSA items (93,5%) and all 14 ASP items (100%). This means they evaluated all MRSA items as being important on the five point Likert scale, except for the item which states that skin problems such as eczema increase the risk of MRSA.

New items suggested by respondents. Additional new items with knowledge that the general public should have were suggested by the stakeholders. These where 15 MRSA knowledge items concerning differences between community associated-, livestock associated- and healthcare associated MRSA, MRSA and pregnancy, reduction of the risk of MRSA through prescribing oral (instead of intravenous) medication, feelings of guild, contacts/housemates of someone who is colonized with MRSA and the treatment of MRSA. Also, five ASP knowledge items were added, concerning the patients' own responsibility in the use of antibiotics, specifically through not asking for antibiotics, not using someone else's antibiotics, questioning the necessity of prescribing antibiotics and using them according to the prescription. All new items are given in Table 5 & Table 6.

Table 1: Round one evaluation of MRSA items.

	Overall N=22 modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=6** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=6** modus (% with that score)
What is MRSA					
• MRSA is a hospital bacterium.	I (77%)	I (75%)	I (67%)	I (83%)	I (83%)
Colonization					
- One can be colonized with MRSA without becoming ill.	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
Prevention					
- Patients who have recently been admitted to a hospital abroad, may be treated in isolation in a Dutch hospital.	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
- Patients who have recently been admitted to a hospital abroad must immediately report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)
- Patients who work with livestock short report so upon admission to a Dutch hospital, so they can be screened for MRSA-colonization.	I (91%)	I (100%)	I (100%)	I (67%)	I (100%)
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.	I (82%)	I (100%)	I (83%)	I (50%)	I (100%)
- The spread of MRSA can be limited via strict application of disinfectant measures and hand hygiene.	I (82%)	N (50%)	I (100%)	I (67%)	I (100%)
- The spread of MRSA can be limited via the use of personal protective equipment.	I (73%)	I (75%)	I (83%)	N-I (50%)	I (83%)
- The spread of MRSA can be limited via a hygienic care- and living environment.	I (64%)	I (50%)	N (50%)	I (67%)	I (83%)
- The spread of MRSA can be limited via correct handling of colonized (clinical) waist and linens.	I (55%)	I (50%)	N (33%)	I (33%)	I (100%)
- Patients who are colonized with MRSA should be treated in isolation in the hospital.	I (86%)	I (100%)	I (83%)	I (67%)	I (100%)
Reservoir					
- MRSA can occur in the blood, in the mucous membranes (such as nose and throat), in the hair and on the skin .	I (64%)	N (75%)	N (50%)	I (67%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Table 1 cont.: Round one evaluation of MRSA items.

	Overall N=22 modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=6** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=6** modus (% with that score)
Spread					
- MRSA can for example occur on floors, toilets or medical equipment and spread via touch.	I (55%)	N (50%)	I (67%)	N (50%)	I (100%)
- MRSA can spread through skin-to-skin contact.	I (82%)	I (75%)	I (67%)	I (83%)	I (100%)
- MRSA can spread from animals to humans.	I (64%)	I (75%)	I (67%)	N (67%)	I (83%)
- MRSA can spread in the Netherlands via people who have been abroad.	I (50%)	U (75%)	N (50%)	N (50%)	I (100%)
Consequences					
- MRSA-colonization may cause an infection.	I (91%)	I (100%)	I (100%)	I (67%)	I (100%)
- MRSA-infection may cause death.	I (64%)	I (50%)	N (50%)	I (50%)	I (100%)
- A patient who is colonized with MRSA on average stays longer in a hospital than a patient without MRSA-colonization.	I (59%)	I (75%)	I (50%)	N (67%)	I (100%)
Risk factors					
- Unhygienic circumstances increase the risk of MRSA-colonization.	I (59%)	U-I (50%)	I (67%)	N (50%)	I (100%)
- Wounds and other skin disorders increase the risk of a MRSA-infection.	I (82%)	I (100%)	I (67%)	I (67%)	I (100%)
- A recent hospitalization abroad increases the risk of MRSA-colonization.	I (91%)	I (100%)	I (83%)	I (83%)	I (100%)
- Skin-to-skin contact increases the risk of a MRSA-infection.	I (77%)	I (75%)	I (83%)	N-I (50%)	I (100%)
- Skin problems such as eczema increase the risk of a MRSA-infection.	I (64%)	I (100%)	N (50%)	I (50%)	I (67%)
Origins					
- MRSA occurs in hospitals.	I (91%)	I (100%)	I (100%)	I (67%)	I (83%)
- MRSA occurs in nursing homes.	I (86%)	I (75%)	I (67%)	N-I (50%)	I (100%)
- MRSA occurs in the general community.	I (68%)	- (25%)	I (83%)	N (67%)	I (100%)
- MRSA occurs in livestock (such as pigs and calves).	I (68%)	I (100%)	I (83%)	N (83%)	I (83%)
Treatment					
- Timely treatment of MRSA-colonization decreases the number of MRSA-infections and deaths that are caused by it.	I (68%)	I (75%)	I (67%)	N (67%)	I (100%)
- A MRSA-infection can only be treated with specific antibiotics.	I (59%)	I (75%)	I (67%)	N (67%)	I (83%)
- Most antibiotics do not work against a MRSA-infection.	I (68%)	I (75%)	I (67%)	N (67%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Table 2: Round one evaluation of antibiotic use items.

	Overall N=22 modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=6** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=6** modus (% with that score)
Antibiotics					
- An antibiotics treatment should be finished completely.	I (82%)	N (50%)	I (83%)	I (100%)	I (100%)
- As little as possible broad-specter antibiotics should be used (such as third generation cephalosporins and floroquinolones).	I (59%)	I (75%)	I (50%)	U (83%)	I (100%)
- An antibiotics treatment should not be too long or short.	I (59%)	- (25%)	I (50%)	U (50%)	I (100%)
- Antibiotics do not work against viruses.	I (77%)	I (75%)	I (67%)	I (67%)	I (100%)
- Antibiotics do not work against colds or coughs.	I (77%)	I (50%)	I (83%)	I (67%)	I (100%)
- Antibiotics can kill bacteria.	I (59%)	N (50%)	I (67%)	N (83%)	I (100%)
- Antibiotics are prescribed preventively in stock farms, which increases the risk of development of resistant bacteria.	I (68%)	I (75%)	I (67%)	N (50%)	I (100%)
- Bacteria that normally live on the skin and in the gut are good for your health.	I (68%)	N (50%)	I (67%)	I (67%)	I (100%)
- Antibiotics can also destroy 'good' bacteria that live on the skin or in the stomach.	I (82%)	I (50%)	I (67%)	I (100%)	I (100%)
Resistentance					
- If too much antibiotics are used, they are less likely to work as well in the future.	I (82%)	I (75%)	I (83%)	I (67%)	I (100%)
- If too much antibiotics are used, increasingly many resistant bacteria will develop.	I (95%)	I (75%)	I (100%)	I (100%)	I (100%)
- An infection that is caused by a resistant bacterium is difficult to treat.	I (91%)	I (75%)	I (100%)	I (83%)	I (100%)
- Bacteria can become resistant against antibiotics.	I (91%)	I (75%)	I (100%)	I (83%)	I (100%)
- Anyone can become colonized with a resistant bacterium.	I (68%)	I (50%)	I (83%)	N (50%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

4.1.2 Delphi round two

Re-evaluation of existing knowledge items. A total of 19 respondents participated in the second round of the Delphi: Three clinical-microbiologists, five infection control professionals, six health service organization employees and five (former) MRSA-patients. A total of 28 MRSA knowledge items and 13 ASP knowledge items which were based on literature were re-evaluated. An overview of the re-evaluation of the existing knowledge items is given in Table 3 and Table 4. Consensus is reached on two MRSA knowledge items (7,1%) and one ASP knowledge item (7,7%). Boxplots of the round-two consensus items are given in Appendix G. The consensus items are considered important by the stakeholders:

- Patients who work with livestock should report so upon admission to a Dutch hospital, so they can be screened for MRSA-colonization.
- Patients who are colonized with MRSA should be treated in isolation in the hospital.
- When too much antibiotics are used, they are less likely to work as well in the future.

Between groups. Within each subgroup of stakeholders consensus was reached for more items after round two of the Delphi. An overview of the degree of consensus of each subgroup on the existing knowledge items in round two is given in Table 3, Table 4 and Appendix D.

The clinical microbiologists agreed on 27 MRSA knowledge items (96,4%) and all 18 ASP knowledge items (100,0%). Therefore consensus within this group was extremely high. They reached consensus on the importance (on the five point Likert scale) of all but one MRSA knowledge item: MRSA can be spread to the Netherlands via people who have been abroad.

The infection control professionals agreed on ten MRA knowledge items (35,7%) and on six ASP knowledge items (46,2%). They rated all items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, the consensus items where:

- The spread of MRSA can be limited via strict application of disinfection measures and hand hygiene.
- The spread of MRSA can be limited via the use of personal protective equipment.
- MRSA can spread through skin-to-skin contact.
- MRSA-colonization may cause an infection.
- Wounds and other skin disorders increase the risk of a MRSA-infection.
- MRSA occurs in nursing homes.
- MRSA occurs in livestock.
- A MRSA-infection can only be treated with specific antibiotics.
- An antibiotics treatment should be finished completely.
- An antibiotics treatment should not be too long or short.
- Antibiotics do not work against colds or coughs.
- Bacteria can become resistant against antibiotics.
- Antibiotics are prescribed preventively in stock farms, which increases the risk of the development of resistant bacteria.

The public health service employees agreed on eight MRSA knowledge items (28,6%) and six ASP knowledge items (46,2%). They rated most items as being important (on the five point Likert scale) knowledge for the general public. Besides the items that all stakeholders agreed on, the consensus items where:

- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital to allow for adequate screening.
- The spread of MRSA can be limited via strict application of disinfection measures and hand hygiene.
- MRSA can spread through skin-to-skin contact.
- A recent hospitalization abroad increases the risk of MRSA.
- Skin problems such as eczema increase the risk of MRSA.
- An antibiotics treatment should be finished completely.
- Antibiotics do not work against colds or coughs.
- Antibiotics are prescribed preventively in stock farms, which increases the risk of the development of resistant bacteria.
- An infection that is caused by a resistant bacterium is difficult to treat.

The public health service employees considered two items neutrally important on the five point Likert scale:

- The spread of MRSA can be limited via a hygienic care- and living environment.
- Antibiotics can kill bacteria.

The (former) MRSA-patients agreed on 25 MRSA knowledge items (89,3%) and on all 13 ASP knowledge items (100%) (which can be found in Table 4). They rated all items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, the consensus items where:

- MRSA is a hospital bacterium.
- Patients who work with livestock should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- The spread of MRSA can be limited via strict application of disinfection measures and hand hygiene.
- The spread of MRSA can be limited via the use of personal protective equipment.
- The spread of MRSA can be limited via a hygienic care- and living environment.
- The spread of MRSA can be limited via correct handling of colonized (clinical) waist and linens.
- MRSA-colonized patients must be treated in isolation in a hospital.
- MRSA can occur in the blood, mucous membranes (such as nose and throat), hair and on the skin.
- MRSA can for example occur on floors, toilets or medical equipment and spread via touch.
- MRSA can spread through skin-to-skin contact.
- MRSA can spread from animals to humans.
- MRSA can spread in the Netherlands via people who have been abroad.
- MRSA-colonization may cause an infection.
- MRSA-infection may cause death.
- A patient who is colonized with MRSA on average stays longer in a hospital than a patient without MRSA-colonization.
- Unhygienic circumstances increase the risk of MRSA-colonization.
- Wounds and other skin disorders increase the risk of a MRSA-infection.
- A recent hospitalization abroad increases the risk of a MRSA-infection.
- Skin-to-skin contact increases the risk of a MRSA-infection.
- MRSA occurs in hospitals.
- MRSA occurs in nursing homes.
- MRSA occurs in the general community.
- MRSA occurs in livestock (such as pigs and calves).
- Timely treatment of MRSA-colonization decreases the number of MRSA-infections and deaths.
- A MRSA-infection can only be treated with specific antibiotics.
- Most antibiotics do not work against a MRSA-infection.

Motivation for evaluation of items. In round two, the respondents also gave the motivations for their evaluation of the items. These arguments were grouped together and summarized in one argument for low-importance and one argument for high-importance (which were also reported back to respondents in round three). A complete overview of the items and argumentations is given in Appendix E. Overall it seems that respondents who rated an item as being *important* had more explicit argumentations for doing so then respondents who rated an item as being *unimportant.* Furthermore, most arguments for high-importance basically stated that knowledge is necessary to comprehend the relevance of infection prevention and –control measures and to increase awareness among the general public about what they can do themselves. This was the case for all items except for a few. The other items were mainly considered important to:

- Reduce fear (the spread of MRSA can be limited via the use of personal protective equipment; bacteria that normally live on the skin and in the gut are good for your health).
- Reduce feelings of guilt (anyone can become colonized with a resistant bacterium).
- Increase social pressure via awareness (antibiotics are prescribed preventively in stock farms, which increases the risk of the development of resistant bacteria).
- Ensure that a coherent message is send-out to the public (it is important that an antibiotics treatment is completely finished).

Most arguments for low-importance on the five point Likert scale basically stated that knowledge is unnecessary since the topic in the items is the responsibility of healthcare workers. Items that were not explained via this argumentation were considered unimportant because:

- They applied to a relatively small group of people (MRSA can spread from animal to human; MRSA can spread in the Netherlands can be spread via people who have been abroad; wounds and other skin disorders increase the risk of MRSA-colonization; a recent hospitalization abroad increases the risk of MRSA-colonization; skin-to-skin contact

increases the risk of MRSA-colonization; MRSA occurs in the general community; MRSA occurs in livestock farming; an infection that is caused by a resistant bacterium is difficult to treat).

- It may cause too much fear in the general public (MRSA-colonization may cause an infection; MRSA-infection may lead to death).
- To avoid stigmatization of MRSA-colonized patients (Patients who have previously been colonized or infected with MRSA must report so immediately upon hospitalization in a Dutch hospital, to enable screening).
- To avoid limiting the problem of MRSA too much (MRSA is a hospital bacterium; MRSA occurs in hospitals).
- The general public would not know what to do with the knowledge (MRSA can occur in the blood, mucous membranes, hair and on the skin; unhygienic circumstances increase the risk of MRSA-colonization; antibiotics can kill 'good' bacteria that live on the skin and in the gut).
- Patients only need to know what they can do, not necessarily why this is so (timely treatment of MRSA-colonization reduces the amount of MRSA-infections and deaths; antibiotics are prescribed preventively in stock farms, which increases the risk of the development of resistant bacteria; anyone can become colonized with a resistant bacterium).
- Patients do not care about what and wherefore, as long as they are treated (a MRSA-infection can only be treated with specific antibiotics; antibiotics can kill bacteria).
- There are too many exceptions to the rule in the item, which may cause unnecessary confusion (it is important that an antibiotics treatment is completely finished).

Comparison with prior Delphi round. Inherent to the Delphi methodology is that respondents can change their evaluation of items over the different rounds. They can do so based on the opinions of other respondents or because of the participation in the Delphi, which might increase awareness. Some interesting observations can be made in comparing the first and second round of this Delphi. The most striking changes are discussed here. Changes from non-consensus to consensus will not be discussed as being remarkable, since this is the very purpose of the Delphi method.

The clinical microbiologists changed their opinions from consensus to non-consensus within the subgroup once for the MRSA knowledge items and not at all for any ASP knowledge item. This item is:

- MRSA can be spread in the Netherlands via people who have been abroad (from 75% to 33% *unimportant*)

The infection control professionals changed their opinions five times about MRSA knowledge items and two times about ASP from consensus to non-consensus. More specifically they did so in the judgment of the items:

- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital to allow for adequate screening (from 83% to 60% *important*),
- A recent hospitalization abroad increases the risk of MRSA-colonization (from 83% to 60% *important*),
- Skin-to-skin contact increases the risk of MRSA-colonization (from 83% to 60% *important*),
- MRSA can occur in hospitals (from 100% to 60% *important*)
- MRSA can occur in the general community (from 83% to 20% *important*).
- An infection caused by a resistant bacterium is difficult to treat (from 100% to 60% *important*)
- Anyone can get colonized with a resistant bacterium (from 83% *important* to 60% *neutral*).

Health service organization employees changed their opinions from consensus to non-consensus once for the MRSA knowledge items and three times for the ASP knowledge items:

- MRSA is a hospital bacterium (from 83% to 67% *important*).
- As little as possible broad-specter antibiotics should be used (from 83% *unimportant* to 67% i*mportant*)
- Antibiotics can kill good bacteria that live on the skin and in the gut (from 100% to 67% *important*).
- Bacteria can become resistant to antibiotics (from 83% *important* to 67% *neutral*)

Patients changed their opinions (from consensus to non-consensus) two times about MRSA knowledge items. They did not go from consensus to non-consensus for any ASP knowledge items. Changed items where:

- MRSA can spread via skin-to-skin contact (from 100% to 60% *important*)
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital to allow for adequate screening (from 100% to 60% *important*).

Table 3: Round two re-evaluation of existing MRSA items.

	Overall N=19 modus (% with that score)	**CM N=3** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
What is MRSA					
- MRSA is a hospital bacterium.	I (68%)	I (67%)	U-I (40%)	I (67%)	I (100%)
Prevention					
- Patients who work with livestock short report so upon admission to a Dutch hospital, so they can be screened for MRSA-colonization .	I (95%)	I (100%)	I (80%)	I (100%)	I (100%)
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.	I (79%)	I (67%)	I (60%)	I (83%)	I (80%
- The spread of MRSA can be limited via strict application of disinfectant measures and hand hygiene.	I (89%)	I (100%	I (80%)	I (83%)	I (100%)
- The spread of MRSA can be limited via the use of personal protective equipment.	I (79%)	I (100%)	I (80%)	I (67%)	I (80%)
- The spread of MRSA can be limited via a hygienic care- and living environment.	I (53%)	I (67%)	I (60%)	N (83%)	I (100%)
- The spread of MRSA can be limited via correct handling of colonized (clinical) waist and linens.	I (53%)	I (67%)	U-N (40%)	I (50%)	I (80%)
- Patients who are colonized with MRSA should be treated in isolation in the hospital.	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
Reservoir					
- MRSA can occur in the blood, in the mucous membranes (such as nose and throat), in the hair and on the skin.	N (47%)	N (67%)	N (60%)	N-I (50%)	I (80%)
Spread					
- MRSA can for example occur on floors, toilets or medical equipment and spread via touch.	I (79%)	I (100%)	I (60%)	N (50%)	I (100%)
- MRSA can spread through skin-to-skin contact.	I (79%)	I (100%)	I (80%)	I (83%)	I (60%)
- MRSA can spread from animals to humans.	I (74%)	I (100%)	I (60%)	N (50%)	I (100%)
- MRSA can spread in the Netherlands via people who have been abroad.	I (47%)	- (33%)	U (60%)	N-I (33%)	I (80%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Table 3 cont.: Round two re-evaluation of existing MRSA items.

	Overall N=19 modus (% with that score)	**CM N=3** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
Consequences					
- MRSA-colonization may cause an infection.	I (84%)	I (100%)	I (80%)	I (67%)	I (100%)
- MRSA-infection may cause death.	I (63%)	I (100%)	N (60%)	N-I (50%)	I (80%)
- A patient who is colonized with MRSA on average stays longer in a hospital than a patient without MRSA-colonization.	N (37%)	I (67%)	U-N (40%)	U (50%)	I (60%)
Risk factors					
- Unhygienic circumstances increase the risk of MRSA-colonization.	I (47%)	I (100%)	N-I (40%)	N (67%)	I (100%)
- Wounds and other skin disorders increase the risk of a MRSA-infection.	I (79%)	I (100%)	I (80%)	I (67%)	I (80%)
- A recent hospitalization abroad increases the risk of MRSA-colonization.	I (84%)	I (100%)	N (60%)	I (100%)	I (100%)
- Skin-to-skin contact increases the risk of a MRSA-infection.	I (74%)	I (100%)	I (60%)	N-I (50%)	I (100%)
- Skin problems such as eczema increase the risk of a MRSA-infection.	I (74%)	I (67%)	N (60%)	I (83%)	I (60%)
Origins					
- MRSA occurs in hospitals.	I (79%)	I (100%)	I (60%)	I (67%)	I (100%)
- MRSA occurs in nursing homes.	I (79%)	I (67%)	I (100%)	N-I (50%)	I (100%)
- MRSA occurs in the general community.	I (79%)	I (100%)	- (20%)	N-I (50%)	I (100%)
- MRSA occurs in livestock (such as pigs and calves).	I (84%)	I (100%)	I (80%)	I (67%)	I (100%)
Treatment					
- Timely treatment of MRSA-colonization decreases the number of MRSA-infections and deaths that are caused by it.	I (63%)	I (100%)	N (60%)	N (67%)	I (100%)
- A MRSA-infection can only be treated with specific antibiotics.	I (63%)	I (100%)	U (80%)	I (50%)	I (100%)
- Most antibiotics do not work against a MRSA-infection.	I (63%)	I (100%)	N (60%)	N (50%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Table 4: Round two re-evaluation of existing antibiotic use items.

Items	Overall N=19 modus (% with that score)	CM N=3 modus (% with that score)	ICP N=5 modus (% with that score)	HSO N=6 modus (% with that score)	P N=5 modus (% with that score)
Antibiotics					
- An antibiotics treatment should be finished completely.	I (89%)	I (67%)	I (80%)	I (100%)	I (100%)
- As little as possible broad-specter antibiotics should be used (such as third generation cephalosporins and floroquinolones).	I (47%)	I (100%)	I (60%)	I (67%)	I (80%)
- An antibiotics treatment should not be too long or short.	I (79%)	I (100%)	I (80%)	I (50%)	I (100%)
- Antibiotics do not work against viruses.	I (79%)	I (100%)	I (60%)	I (67%)	I (100%)
- Antibiotics do not work against colds or coughs.	I (89%)	I (100%)	I (80%)	I (100%)	I (80%)
- Antibiotics can kill bacteria.	N (53%)	I (67%)	N (60%)	N (100%)	I (80%)
- Antibiotics are prescribed preventively in stock farms, which increases the risk of development of resistant bacteria.	I (89%)	I (67%)	I (100%)	I (83%)	I (100%)
- Bacteria that normally live on the skin and in the gut are good for your health.	I (74%)	I (100%)	N (40%)	I (67%)	I (100%)
- Antibiotics can also destroy 'good' bacteria that live on the skin or in the stomach.	I (74%)	I (100%)	I (60%)	I (67%)	I (80%)
Resistentance					
- If too much antibiotics are used, they are less likely to work as well in the future.	I (95%)	I (100%)	I (80%)	I (100%)	I (100%)
- An infection that is caused by a resistant bacterium is difficult to treat.	I (84%)	I (100%)	I (60%)	I (83%)	I (100%)
- Bacteria can become resistant against antibiotics.	I (74%)	I (100%)	I (80%)	N (67%)	I (100%)
- Anyone can become colonized with a resistant bacterium.	I (63%)	I (67%)	N (60%)	N-I (50%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Evaluation of knowledge items suggested by respondents. Besides the already existing knowledge items, which were based on literature, new items were suggested in round 1 by the stakeholders to include in the Delphi study. A total of 15 knowledge items concerning MRSA and five concerning ASP were added and evaluated. An overview of the evaluation of the new knowledge items is given in Table 5 and Table 6. The entire group of stakeholders reached consensus on one ASP item (20,0%). Boxplot of this item is given in Appendix G. The consensus item was:

- Patients themselves are responsible for using antibiotics according to their prescription, including after leaving the hospital.

Between groups. The clinical microbiologists agreed on 14 MRSA knowledge items (93,3%) and all five ASP knowledge items (100%). Therefore consensus within this group was extremely high. They reached consensus on the importance of all items, which can be found in Table 5 & Table 6, except for the item that states that the only difference between MRSA and MSSA is that MRSA is resistant against Methicillin (an antibiotic).

The infection control professionals agreed on nine MRA knowledge items (60,0%) and two ASP knowledge items (40,0%). They rated most items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, the consensus items where:

- MRSA-colonization is not the patient's fault.
- MRSA *can* be treated via specific antibiotics and decolonization.
- In case of known MRSA-colonization a patient can be treated prior to surgery.
- There is no increased chance of complications, miscarriage or consequences for the baby when a pregnant woman is colonized with MRSA.
- It is important to wash ones hands and keep pump equipment very clean for breast feeding.
- MRSA-colonization is not always dangerous for contacts, except for if they already have an increased risk (due to skin disorders or poor health).
- People must be well informed about what they should do if a family member is infected with community associated MRSA.
- Patients should not use antibiotics which where not prescribed to them.

The infection control professionals rated these items as being of neutral importance for the general public:

- Problems with hospital associated MRSA differ from problems with community associated MRSA.
- Community associated MRSA does not necessarily cause any problems but may pose a threat on healthy people.

The public health service employees agreed on three MRSA knowledge items (20,0%) and three ASP knowledge items (60,0%). They rated most items as being important (on the five point Likert scale) knowledge for the general public. Besides the items that all stakeholders agreed on, the consensus items where:

- MRSA-colonization is not always dangerous for contacts, except for if they already have an increased risk (due to skin disorders or poor health).
- People must be well informed about what they should do if a family member is infected with community associated MRSA.
- Patients should not ask their general practitioner for antibiotics, since he/she might then feel pressure to prescribe them.
- Hospitalized patients can politely question the necessity of using antibiotics for them.

The public health service employees rated one items as being neutrally important on the five point Likert scale:

- In case of known MRSA-colonization a patient can be treated prior to surgery.

The MRSA-patients agreed on 13 MRSA knowledge items (86,7%) and all five ASP knowledge items (100%). Which means they considered all items important (on the five point Likert scale) but two: Orally taken medication causes less risk of a MRSA-infection then intravenous medication and decolonization cannot be applied preventively on everybody who is at an increased risk.

Table 5: Round two evaluation of newly suggested MRSA items.

	Overall N=19 modus (% with that score)	**CM N=3** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
What is MRSA					
- The only difference between MSSA and MRSA is that MRSA is resistant against Methicillin (an antibiotic).	I (42%)	N (33%)	U (60%)	U (50%)	I (100%)
- There are three different types of MRSA: hospital associated MRSA, livestock associated MRSA and community associated MRSA.	I (63%)	I (67%)	U (40%)	I (50%)	I (100%)
- Problems with hospital associated MRSA differ from problems with community associated MRSA.	I (63%)	I (67%)	N (80%)	I (67%)	I (100%)
- Community associated MRSA does not necessarily cause any problems but may pose a threat on healthy people.	I (63%)	I (100%)	N (80%)	I (50%)	I (100%)
Consequences					
- MRSA-colonization is not the patient's fault.	I (79%)	I (100%)	I (80%)	N (50%)	I (80%)
Risk factors					
- Orally taken medication causes less risk of a MRSA-infection then intravenous medication.	U (42%)	I (67%)	N (40%)	U (50%)	I (60%)
Treatment					
- MRSA *can* be treated via specific antibiotics and decolonization.	I (84%)	I (100%)	I (80%)	I (67%)	I (100%)
- In case of known MRSA-colonization a patient can be treated prior to surgery.	I (68%)	I (100%)	I (80%)	N (83%)	I (100%)
- Treatment (decolonization) cannot preventively be applied to anyone with increased risk of MRSA-colonization.	N-I (42%)	I (100%)	N (60%)	N (50%)	I (60%)
MRSA and pregnancy					
- There is no increased chance of complications, miscarriage or consequences for the baby when a pregnant woman is colonized with MRSA.	I (68%)	I (67%)	I (80%)	N-I (50%)	I (80%)
- A MRSA-infection during pregnancy/delivery increases the risk of infections or other disorders.	I (63%)	I (67%)	I (60%)	N (67%)	I (100%)
- It is important to wash hands and keep pump equipment very clean for breast feeding.	I (79%)	I (100%)	I (80%)	I (50%)	I (100%)
Contacts of MRSA-colonized person					
- MRSA-colonization is not always dangerous for contacts, except for if they already have an increased risk (due to skin disorders or poor health).	I (89%)	I (100%)	I (80%)	I (83%)	I (100%)
- Treatment of contacts of MRSA-colonized people is not always useful.	I (74%)	I (100%)	I (60%)	I (67%)	I (80%)
- People must be well informed about what they should do if a family member is infected with community associated MRSA.	I (89%)	I (67%)	I (100%)	I (83%)	I (100%)

Table 6: Round two evaluation of newly suggested antibiotic use items.

Items	Overall N=19 modus (% with that score)	CM N=3 modus (% with that score)	ICP N=5 modus (% with that score)	HSO N=6 modus (% with that score)	P N=5 modus (% with that score)
Limited antibiotics use					
- Patients should not use antibiotics which were not prescribed to them.	I (84%)	I (100%)	I (80%)	I (67%)	I (100%)
- Patients should not ask their general practitioner for antibiotics, since he/she might then feel pressure to prescribe them.	I (79%)	I (100%)	I (60%)	I (83%)	I (80%)
- Hospitalized patients can politely question the necessity of using antibiotics for them..	I (84%)	I (100%)	I (60%)	I (83%)	I (80%)
- Alternatives for antibiotics should always be considered for treatment.	I (79%)	I (100%)	I (60%)	I (67%)	I (100%)
Correct antibiotics use					
- Patients themselves are responsible for using antibiotics according to their prescription, including after leaving the hospital.	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Evaluation of information sources. Respondents were in round one asked to suggest sources of information that the general public could use to gather reliable information on MRSA and ASP. A total of 21 information-sources were evaluated for MRSA and 20 for ASP (see Table 7 & Table 8). The entire group reached consensus on one MRSA information-source (4,8%) and three ASP information-sources (15,0%). Boxplots of these items are given in Appendix G. The consensus items are all considered important information-sources:

- The general practitioner as an information source for MRSA
- The medical doctor who treats the patient as a source of information for ASP
- The general practitioner as a source of information for ASP
- The medical specialist as a source of information for ASP

Between groups. The clinical microbiologists agreed on 20 MRSA information sources (95,2%) and 20 ASP information sources (100%). Therefore consensus within this group was extremely high. The only source of information for MRSA they did not agree on was the pharmacy. Furthermore, they rated the website www.ggd.nl as being of neutral importance on the five point Likert scale and www.wip.nl as being unimportant for MRSA. For ASP they rated health service organizations and the website www.google.nl as being of neutral importance. Furthermore they did not agree that additional information-sources about antibiotics use for the general public is not needed.

The infection control professionals agreed on 11 MRSA information sources (52,4%) and on 11 ASP information sources (55,0%). They rated most items as being important information sources for the general public. Besides the items that all stakeholders agreed on, the consensus items are given below.

MRSA:
- Folders from infection prevention departments in hospitals are an information source for MRSA
- Several television broadcasts are an information source for MRSA Internet forums an information source for MRSA Health service organizations are an information source for MRSA
- Infection control professionals are an information source for MRSA
- General practitioners are an information source for MRSA
- Pharmacies are an information source for MRSA
- www.rivm.nl/MRSA is an information source for MRSA
- www.rivm.nl/cib is an information source for MRSA
- www.mrsa-net.nl is an information source for MRSA

Antibiotics use:
- Too little information is available on antibiotic use
- Several television broadcasts are an information source for ASP
- Package leaflets of antibiotics are an information source for ASP
- The patients' medical doctor are an information source for ASP
- Nursing staff is an information source for ASP
- Health service organizations are an information source for ASP
- General practitioners are an information source for ASP
- Medical specialists are an information source for ASP
- Pharmacies are an information source for ASP
- www.rivm.nl/cib is an information source for ASP
- www.mrsa-net.nl is an information source for ASP

The infection control professionals rated this item as being of neutral importance on the five point Likert scale:
- Posters in hospitals are a source of information about MRSA

The public health service employees agreed on five MRSA information sources (23,8%) and six ASP information sources (30,0%). They rated most items as being important information sources for the general public. Besides the items that all stakeholders agreed on, the consensus items are given below.

MRSA:
- Folders from infection prevention departments in hospitals are an information source for MRSA
- The patients' medical doctor are an information source for MRSA
- Health service organizations are an information source for MRSA
- General practitioners are an information source for MRSA
- www.rivm.nl/MRSA is an information source for MRSA

Antibiotics use:
- The patients' medical doctor is an information source for ASP
- Nursing staff are an information source for ASP
- General practitioners are an information source for ASP
- Medical specialists are an information source for ASP
- Pharmacies are an information source for ASP

The public health service employees rated this item as neutral on the five point Likert scale:

- Patients should be stimulated to read more information about antibiotics use.

The (former) MRSA-patients agreed on 16 MRSA information sources (76,2%) and 15 ASP information sources (75,0%). They rated all items as being important information sources for the general public. Besides the items that all stakeholders agreed on, the consensus items are given below.

MRSA:

- Folders from infection prevention departments in hospitals are an information source for MRSA
- The government (via 'postbus 51' initiatives) is an information source for MRSA
- Posters in hospitals are an information source for MRSA
- The patients' medical doctor are an information source for MRSA
- Nursing staff is an information source for MRSA
- Health service organizations are an information source for MRSA
- Infection control professionals are an information source for MRSA
- General practitioners are an information source for MRSA
- Pharmacies are an information source for MRSA
- The internet in general is an information source for MRSA
- Internet forums are an information source for MRSA
- www.rivm.nl/MRSA is an information source for MRSA
- www.mrsa-net.nl is an information source for MRSA
- www.google.nl is an information source for MRSA
- www.ggd.nl is an information source for MRSA
- www.wikipedia.nl is an information source for MRSA

Antibiotics use:

- Too little information is available on antibiotic use
- Patients should be stimulated to read more information about ASP
- Folders from infection prevention departments in hospitals are an information source for ASP
- Newspapers are an information source for ASP
- Several television broadcasts are an information source for ASP
- Package leaflets of antibiotics are an information source for ASP
- The government (via 'postbus 51' initiatives) is an information source for ASP
- The internet in general is an information source for ASP
- www.rivm.nl/cib is an information source for ASP
- www.google.nl is an information source for ASP
- www.mrsa-net.nl is an information source for ASP
- The patients' medical doctor are an information source for ASP
- Nursing staff is an information source for ASP
- Health service organizations are an information source for ASP
- General practitioners are an information source for ASP
- Medical specialists are an information source for ASP

Table 7: Round two evaluation of suggested scources of information about MRSA.

Items	Overall N=19 modus (% with that score)	CM N=3 modus (% with that score)	ICP N=5 modus (% with that score)	HSO N=6 modus (% with that score)	P N=5 modus (% with that score)
- Folders from infection prevention departments.	I (84%)	I (67%)	I (100%)	I (83%)	I (80%)
- The government (via 'postbus 51' initiatives).	I (63%)	I (100%)	I (60%)	N (50%)	I (80%)
- Newspapers.	I (47%)	I (67%)	I (40%)	U (50%)	I (60%)
- Several television broadcasts.	I (63%)	I (100%)	I (80%)	N (50%)	I (60%)
- Posters in hospitals.	I (68%)	I (67%)	N (80%)	I (67%)	I (80%)
- The internet in general.	I (63%)	I (100%)	U (40%)	N-I (50%)	I (80%)
- Internet forums	I (63%)	I (100%)	I (80%)	N (67%)	I (80%)
- www.rivm.nl/MRSA	I (79%)	I (67%)	I (80%)	I (83%)	I (80%)
- www.rivm.nl/cib	I (63%)	I 67%)	I (80%)	N-I (50%)	I (60%)
- www.wip.nl	I (37%)	U (67%)	- (20%)	N (50%)	I (60%)
- www.MRSA-net.nl	I (84%)	I (100%)	I (100%)	I (67%)	I (80%)
- www.google.nl	I (53%)	I (67%)	N (60%)	- (33%)	I (80%)
- www.eursafety.eu	I (47%)	I (67%)	I (60%)	- (33%)	N (60%)
- www.ggd.nl	I (42%)	N (67%)	I (60%)	U-N (50%)	I (80%)
- www.wikipedia.nl	I (47%)	I (67%)	N (40%)	- (33%)	I (80%)
- The patient's medical doctor	I (79%)	I (67%)	I (60%)	I (83%)	I (80%)
- Nursing staff	I (74%)	I (100%	I (60%)	I (67%)	I (80%)
- HSO	I (79%)	I (67%)	I (80%)	I (83%)	I (80%)
- Infection control professionals	I (74%)	I (67%)	I (100%)	N-I (50%)	I (80%)
- General practitioners	I (95%)	I (100%)	I (100%)	I (100%)	I (80%)
- Pharmacies	I (47%)	N (33%)	I (80%)	N (67%)	I (80%)

Table 8: Round two evaluation of suggested sources of information on antibiotic use.

Items	Overall N=19 modus (% with that score)	CM N=3 modus (% with that score)	ICP N=5 modus (% with that score)	HSO N=6 modus (% with that score)	P N=5 modus (% with that score)
- Too little information is available on antibiotic use.	I (74%)	I (100%)	I (80%)	N-I (33%)	I (100%
- Patients should be stimulated to read more about antibiotics use.	I (63%)	I (100%)	I (60%)	N (83%)	I (100%)
- Additional information sources on antibiotics use for the general public are not needed.	N (42%)	U (100%)	N (60%)	N (50%)	I (60%)
- Folders from infection prevention departments.	I (58%)	I (67%)	I (60%)	N (50%)	I (100%)
- Newspapers.	I (63%)	I (100%)	U (60%)	I (50%)	I (100%)
- Several television broadcasts.	I (74%)	I (100%)	I (80%)	N (50%)	I (100%)
- Package leaflets of antibiotics.	I (84%)	I (100%)	I (80%)	I (67%)	I (100%)
- The government (via 'postbus 51' initiatives).	I (74%)	I (100%)	I (60%)	N-I (50%)	I (100%)
- The internet in general	I (53%)	I (100%)	N (60%)	N (50%)	I (80%)
- www.eursafety.eu	I (58%)	I (100%)	I (60%)	N (50%)	I (60%)
- www.rivm.nl/cib	I (74%)	I (67%)	I (80%)	N-I (50%)	I (100%)
- www.google.nl	I (53%)	N (67%)	N (60%)	I (50%)	I (80%)
- www.MRSA-net.nl	I (74%)	I (67%)	I (80%)	I (50%)	I (100%)
- ecdc.europa.eu	N (47%)	I (100%)	N (60%)	N (67%)	I (60%)
- The patient's medical doctor	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
- Nursing staff	I (84%)	I (67%)	I (80%)	I (83%)	I (100%)
- HSO	I (74%)	N (67%)	I (80%)	I (67%)	I (100%)
- General practitioners	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)
- Medical specialists	I (95%)	I (67%)	I (100%)	I (100%)	I (100%)
- Pharmacies	I (89%)	I (67%)	I (100%)	I (83%)	I (100%)

4.1.3 Delphi round three

Re-evaluation of existing knowledge items. A total of 20 respondents participated in the third round of the Delphi: Four clinical-microbiologists, five infection control professionals, six health service organization employees and five (former) MRSA-patients. A total of 26 MRSA knowledge items and 12 ASP knowledge items which were based on literature were re-evaluated. An overview of the second re-evaluation of the existing knowledge items is given in Table 9 and Table 10. In this final round consensus is reached on one MRSA knowledge item (3,8%) and one ASP knowledge item (8,3%). Boxplots of the round-three consensus items are given in Appendix H. The consensus items are considered important by the stakeholders:

- A recent hospitalization abroad increases the risk of MRSA-colonization.
- Bacteria can become resistant to antibiotics.

*Between groups***.** Within each subgroup of stakeholders consensus was reached on more items after this final round. The clinical microbiologists agreed on 21 MRSA knowledge items (80,8%) and all 12 ASP knowledge items (100,0%). They rated most items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, the MRSA consensus items are given below.

- MRSA is a hospital bacterium.
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- The spread of MRSA can be limited via strict application of disinfection measures and hand hygiene.
- The spread of MRSA can be limited via the use of personal protective equipment.
- The spread of MRSA can be limited via a hygienic care- and living environment.
- MRSA can occur in the blood, mucous membranes (such as nose and throat), hair and on the skin.
- MRSA can spread through skin-to-skin contact.
- MRSA can spread from animals to humans.
- MRSA can spread in the Netherlands via people who have been abroad.
- MRSA-colonization may cause an infection.
- MRSA-infection may cause death.
- Wounds and other skin disorders increase the risk of a MRSA-infection.
- A recent hospitalization abroad increases the risk of a MRSA-infection.
- Skin-to-skin contact increases the risk of a MRSA-infection.
- Skin problems such as eczema increase the chance of a MRSA-infection.
- MRSA occurs in hospitals.
- MRSA occurs in nursing homes.
- MRSA occurs in livestock (such as pigs and calves).
- Timely treatment of MRSA-colonization decreases the number of MRSA-infections and deaths.
- A MRSA-infection can only be treated with specific antibiotics.
- Most antibiotics do not work against a MRSA-infection.

The clinical microbiologists rated one item as being neutrally important knowledge for the general public:

- MRSA occurs in the blood, mucous membranes, hair and on the skin.

The infection control professionals reached consensus on ten MRSA knowledge items (38,5%) and on eight ASP knowledge items (66,7%). They rated all consensus items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, these items where:

- MRSA is a hospital bacterium.
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital to allow for adequate screening.
- The spread of MRSA can be limited via strict application of disinfection measures and hand hygiene.
- The spread of MRSA can be limited via the use of personal protective equipment.
- MRSA can spread via skin-to-skin contact.
- MRSA-colonization may cause an infection.
- Wounds and other skin disorders increase the risk of a MRSA-infection.
- A recent hospitalization abroad increases the risk of MRSA.
- MRSA occurs in hospitals and nursing homes.
- An antibiotics treatment should be finished completely.
- An antibiotics treatment should not be too long or short.

- Antibiotics are prescribed preventively in stock farms, which increases the risk of the development of resistant bacteria as important.
- Bacteria that normally live on the skin and in the gut are good for one's health.
- Antibiotics may kill healthy bacteria that normally live on the skin and in the gut.
- Bacteria can become resistant against antibiotics.
- An infection that is caused by a resistant bacterium is difficult to treat.
- Anyone can be infected with such a resistant infection.

The health service organization employees agreed on ten MRSA knowledge items (38,5%) and on seven ASP knowledge items (58,3%). They rated most consensus items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, these items where:

- The spread of MRSA can be limited via strict application of disinfection measures and hand hygiene.
- MRSA can spread via skin-to-skin contact.
- MRSA can spread from animal to human.
- MRSA-colonization may cause an infection.
- A recent hospitalization abroad and skin problems such as eczema increase the risk of MRSA.
- Skin-to-skin contact increases the risk of MRSA-colonization.
- MRSA occurs in hospitals.
- An antibiotics treatment should be finished completely.
- Antibiotics do not work against viruses.
- Antibiotics do not work against colds or coughs.
- Antibiotics are prescribed preventively in stock farms, which increases the risk of the development of resistant bacteria as important.
- Bacteria can become resistant against antibiotics.
- An infection that is caused by a resistant bacterium is difficult to treat.

The health service employees rated these items as being neutrally important knowledge for the general public:

- MRSA occurs in the blood, mucous membranes, hair and on the skin.
- Timely treatment of a MRSA-colonization decreases the amount of MRSA-infections and deaths.
- Antibiotics can kill bacteria.

The patients agreed on 20 MRSA knowledge items (76,9%) and on 11 ASP knowledge items (91,7%). They rated all consensus items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, these items where:

- MRSA is a hospital bacterium.
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- The spread of MRSA can be limited via strict application of disinfection measures and hand hygiene.
- The spread of MRSA can be limited via the use of personal protective equipment.
- The spread of MRSA can be limited via a hygienic care- and living environment.
- The spread of MRSA can be limited via correct handling of colonized (clinical) waist and linens.
- MRSA can for example occur on floors, toilets or medical equipment and spread via touch.
- MRSA can spread through skin-to-skin contact.
- MRSA can spread from animals to humans.
- MRSA can spread in the Netherlands via people who have been abroad.
- MRSA-colonization may cause an infection.
- MRSA-infection may cause death.
- Unhygienic circumstances increase the risk of MRSA-colonization.
- Wounds and other skin disorders increase the risk of a MRSA-infection.
- Skin-to-skin contact increases the risk of a MRSA-infection.
- MRSA occurs in nursing homes.
- Timely treatment of MRSA-colonization decreases the number of MRSA-infections and deaths.
- A MRSA-infection can only be treated with specific antibiotics.
- Most antibiotics do not work against a MRSA-infection.
- An antibiotics treatment should be finished completely.
- As little as possible broad-specter antibiotics should be used (especially third generation cephalosporins and fluroquinolones).
- An antibiotics treatment should not be too long or short.
- Antibiotics do not work against viruses.
- Antibiotics do not work against colds or coughs.
- Antibiotics can kill bacteria.
- Bacteria that normally live on the skin and in the gut are good for one's health.
- Antibiotics may kill healthy bacteria that normally live on the skin and in the gut.

- An infection that is caused by a resistant bacterium is difficult to treat.
- Bacteria can become resistant against antibiotics.
- Anyone can be infected with such a resistant infection.

*Comparison with first Delphi round***.** Again a comparison of the results with the first Delphi round is made to provide an overview of striking changes from consensus to non-consensus. The clinical microbiologists changed their opinions from consensus to non-consensus once for the MRSA knowledge items and not at all for the ASP knowledge items. The changed MRSA knowledge item is:

- A MRSA-colonized patient on average stays hospitalized longer than other patients (from 75% *important* to 50% *neutral)*.

The infection control professionals changed their opinions twice for the MRSA knowledge items and once for the ASP knowledge items. More specifically they did so in the judgment of the items:

- Skin-to-skin contact increases the risk of MRSA-colonization (from 83% to 60% *important*).
- MRSA occurs in the general community (from 83% *important* to 60% *neutral*).
- Antibiotics do not work against colds or coughs (from 83% to 60% *important*).

The health service organization employees changed their opinions for one MRSA knowledge item and two ASP knowledge items. These where:

- MRSA is a hospital bacterium (from 83% *important* to 50% *neutral-important*).
- As little as possible broad-specter antibiotics should be used (from 83% *unimportant* to 50% *important*)
- Antibiotics can kill good bacteria that live on the skin and in the gut (from 100% to 67% *important*)

Patients changed their opinions four times for MRSA knowledge items and once for ASP knowledge items:

- MRSA occurs in the blood, mucous membranes, hair and on the skin (from 100% to 60% *important*).
- A patient who is colonized with MRSA on average stays longer in a hospital than a patient without MRSA-colonization (from 100% to 60% *important*).
- MRSA occurs in the general community (from 100% to 60% *important*).
- MRSA occurs in livestock, such as pigs and calves (from 83% to 60% *important*).

Table 9: Round three re-evaluation of existing MRSA items.

	Overall N=20 modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
What is MRSA					
- MRSA is a hospital bacterium.	I (75%)	I (75%)	I (80%)	N-I (50%)	I (100%)
Prevention					
- Patients who have previously been colonized or infected with MRSA should report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.	I (80%)	I (100%)	I (80%)	N (50%)	I (100%)
- The spread of MRSA can be limited via strict application of disinfectant measures and hand hygiene.	I (85%)	I (75%)	I (80%)	I (83%)	I (100%)
- The spread of MRSA can be limited via the use of personal protective equipment.	I (75%)	I (75%)	I (80%)	I (50%)	I (100%)
- The spread of MRSA can be limited via a hygienic care- and living environment.	I (55%)	I (75%)	N (60%)	N (50%)	I (80%)
- The spread of MRSA can be limited via correct handling of colonized (clinical) waist and linens.	I (45%)	I (50%)	U (60%)	U (50%)	I (80%)
Reservoir					
- MRSA can occur in the blood, in the mucous membranes (such as nose and throat), in the hair and on the skin.	N (60%)	N (75%)	I (60%)	N (83%)	I (60%)
Spread					
- MRSA can for example occur on floors, toilets or medical equipment and spread via touch.	I (70%)	I (50%)	I (60%)	I (67%)	I (100%)
- MRSA can spread through skin-to-skin contact.	I (85%)	I (75%)	I (80%)	I (83%)	I (100%)
- MRSA can spread from animals to humans.	I (85%)	I (100%)	I (60%)	I (100%)	I (80%)
- MRSA can spread in the Netherlands via people who have been abroad.	I (65%)	I (100%)	N-I (40%)	N (33%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Table 9 cont.: Round three re-evaluation of existing MRSA items.

	Overall N=20 modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
Consequences					
- MRSA-colonization may cause an infection.	I (85%)	I (75%)	I (80%)	I (83%)	I (100%)
- MRSA-infection may cause death.	I (60%)	I (75%)	N (60%)	N (67%)	I (100%)
- A patient who is colonized with MRSA on average stays longer in a hospital than a patient without MRSA-colonization.	I (45%)	N (50%)	U (60%)	- (33%)	I (60%)
Risk factors					
- Unhygienic circumstances increase the risk of MRSA-colonization.	I (60%)	I (50%)	I (60%)	N (67%)	I (100%)
- Wounds and other skin disorders increase the risk of a MRSA-infection.	I (85%)	I (100%)	I (80%)	I (67%)	I (100%)
- A recent hospitalization abroad increases the risk of MRSA-colonization.	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)
- Skin-to-skin contact increases the risk of a MRSA-infection.	I (80%)	I (75%)	I (60%)	I (83%)	I (100%)
- Skin problems such as eczema increase the risk of a MRSA-infection.	I (60%)	I (75%)	I (60%)	N (50%)	I (60%)
Origin					
- MRSA occurs in hospitals .	I (80%)	I (75%)	I (80%)	I (83%)	I (75%)
- MRSA occurs in nursing homes.	I (70%)	I (75%)	I (80%)	N-I (50%)	I (80%)
- MRSA occurs in the general community.	I (55%)	N (50%)	N (60%)	I (67%)	I (60%)
- MRSA occurs in livestock (such as pigs and calves).	I (70%)	I (75%)	I (60%)	I (83%)	I (60%)
Treatment					
- Timely treatment of MRSA-colonization decreases the number of MRSA-infections and deaths that are caused by it.	I (60%)	I (100%)	N (60%)	N (83%)	I (100%)
- A MRSA-infection can only be treated with specific antibiotics.	I (60%)	I (75%)	U (60%)	I (50%)	I (80%)
- Most antibiotics do not work against a MRSA-infection.	I (60%)	I (100%)	I (60%)	- (33%)	I (80%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Table 10: Round three re-evaluation of existing antibiotic use items.

Items	Overall N=20 modus (% with that score)	CM N=4 modus (% with that score)	ICP N=5 modus (% with that score)	HSO N=6 modus (% with that score)	P N=5 modus (% with that score)
Antibiotics					
- An antibiotics treatment should be finished completely.	I (75%)	I (75%)	I (80%)	I (100%)	I (100%)
- As little as possible broad-specter antibiotics should be used (such as third generation cephalosporins and floroquinolones).	I (65%)	I (75%)	U (60%)	I (50%)	I (100%)
- An antibiotics treatment should not be too long or short.	I (80%)	I (100%)	I (80%)	U-I (50%)	I (100%)
- Antibiotics do not work against viruses.	I (85%)	I (100%)	I (60%)	I (83%)	I (100%)
- Antibiotics do not work against colds or coughs.	I (85%)	I (75%)	I (60%)	I (100%)	I (100%)
- Antibiotics can kill bacteria.	N (60%)	N (75%)	N (60%)	N (83%)	I (80%)
- Antibiotics are prescribed preventively in stock farms, which increases the risk of development of resistant bacteria.	I (80%)	I (75%)	I (80%)	I (100%)	I (60%)
- Bacteria that normally live on the skin and in the gut are good for your health.	I (80%)	I (75%)	I (80%)	I (67%)	I (100%)
- Antibiotics can also destroy 'good' bacteria that live on the skin or in the stomach.	I (80%)	I (75%)	I (80%)	I (67%)	I (100%)
Resistentance					
- An infection that is caused by a resistant bacterium is difficult to treat.	I (90%)	I (100%)	I (80%)	I (83%)	I (100%)
- Bacteria can become resistant against antibiotics.	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)
- Anyone can become colonized with a resistant bacterium.	I (75%)	I (75%)	I (80%)	I (50%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.
I → Important, N → Neutral, U → Unimportant

Re-evaluation of knowledge items suggested by respondents. Besides the knowledge items that where included in the delphi based on literature, the respondents suggested additional items in round 1. These items where re-evaluated in round three. A total of 15 knowledge items concerning MRSA and four concerning ASP were re-evaluated. An overview of the re-evaluation of these items is given in Table 11 and Table 12. The entire group of stakeholders reached consensus on three MRSA items and two ASP items. Boxplots of these items are given in Appendix H. The items were all considered important:

- It is important to wash ones hands and keep pump equipment very clean for breast feeding.
- MRSA-colonization is not always dangerous for contacts, except if they already have an increased risk (due to skin disorders or poor health).
- People must be well informed about what they should do if a family member is infected with community associated MRSA.
- Patients should not use antibiotics which were not prescribed to them.
- Hospitalized patients can politely question the necessity of using antibiotics for them.

Between groups. Within each subgroup of stakeholders consensus was again reached on more items after this final round. The clinical microbiologists agreed on 11 MRSA knowledge items (73,3%) and all four ASP knowledge items (100,0%). They rated all consensus items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, these items where:

- There are three different types of MRSA: hospital associated MRSA, livestock associated MRSA and community associated MRSA.
- Community associated MRSA does not necessarily cause any problems but may pose a threat on healthy people.
- MRSA-colonization is not the patient's fault.
- Orally taken medication causes less risk of a MRSA-infection then intravenous medication
- MRSA *can* be treated via specific antibiotics and decolonization.
- In case of known MRSA-colonization a patient can be treated prior to surgery.
- There is no increased chance of complications, miscarriage or consequences for the baby when a pregnant woman is colonized with MRSA.
- Treatment of contacts of MRSA-colonized people is not always useful.
- Patients should not ask their general practitioner for antibiotics, since he/she might then feel pressure to prescribe them.
- Alternatives for antibiotics should always be considered for treatment.

The infection control professionals agreed on nine MRSA knowledge items (60,0%) and all four ASP knowledge items (100,0%). They rated most consensus items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, these items where:

- Community associated MRSA does not necessarily cause any problems but may pose a threat on healthy people.
- MRSA-colonization is not the patient's fault.
- MRSA *can* be treated via specific antibiotics and decolonization.
- In case of known MRSA-colonization a patient can be treated prior to surgery.
- There is no increased chance of complications, miscarriage or consequences for the baby when a pregnant woman is colonized with MRSA.
- Treatment of contacts of MRSA-colonized people is not always useful.
- Patients should not ask their general practitioner for antibiotics, since he/she might then feel pressure to prescribe them.
- Alternatives for antibiotics shoudl always be considered for treatment.

The infection control professionasl rated one MRSA knowledge items as being neutrally important for the general public to know (on the five point Likert scale):

- Community associated MRSA does not necessarily cause any problems but may pose a threat on healthy people.

The health service organization employees agreed on seven MRSA knowledge items (58,3%) and two ASP knowledge items (50,0%). They rated two consensus items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, these items where:

- MRSA-colonization is not the patient's fault.
- Treatment of contacts of MRSA-colonized people is not always useful.

The health service organization employees rated one item as being neutrally important knowledge for the general public:

- In case of known MRSA-colonization a patient can be treated prior to surgery.

The health service organization employees also rated one item as being unimportant for the general public to know (on the five point Likert scale):

- Orally taken medication causes less risk of a MRSA-infection than intravenous medication

The patients agreed on 12 MRSA knowledge items (80,0%) and all four ASP knowledge items (100,0%). They rated all consensus items as being important knowledge for the general public. Besides the items that all stakeholders agreed on, these items where:

- The only difference between MSSA and MRSA is that MRSA is resistant against Methicillin (an antibiotic).
- There are three different types of MRSA: hospital associated MRSA, livestock associated MRSA and community associated MRSA.
- Problems with hospital associated MRSA differ from problems with community associated MRSA.
- Community associated MRSA does not necessarily cause any problems but may pose a threat on healthy people.
- MRSA-colonization is not the patient's fault.
- Orally taken medication causes less risk of a MRSA-infection then intravenous medication
- MRSA *can* be treated via specific antibiotics and decolonization.
- In case of known MRSA-colonization a patient can be treated prior to surgery.
- A MRSA-infection during pregnancy/delivery increases the risk of infections or other disorders.
- Patients should not ask their general practitioner for antibiotics, since he/she might then feel pressure to prescribe them.
- Alternatives for antibiotics should always be considered for treatment.

Comparison with prior Delphi round. Again a comparison of the results with the prior Delphi round is made to provide an overview of striking changes from consensus to non-consensus. None of the subgroups changed their opinions from consensus to non-consensus for any of the ASP knowledge items. The health service organization employees did not change their opinions for any of the items. The clinical microbiologists changed their opinions from consensus to non-consensus for three MRSA knowledge items. The changed MRSA knowledge items are:

- Problems with hospital associated MRSA differ from problems with community associated MRSA (from 67% *important* to 50% *neutral-important)*.
- Treatment (decolonization) cannot preventively be applied to anyone with increased risk of MRSA-colonization (from 100% to 50% *important*).
- A MRSA-infection during pregnancy/delivery increases the risk of infections or other disorders (from 67% *important* to 50% *neutral*).

The infection control professionals changed their opinions from consensus to non-consensus for one MRSA knowledge item:

- Problems with hospital associated MRSA differ from problems with community associated MRSA (from 80% *neutral* to 40% *neutral-important*).

The patients changed their opinions from consensus to non-consensus for two MRSA items:

- There is no increased chance of complications, miscarriage or consequences for the baby when a pregnant woman is colonized with MRSA (from 80% to 60% *important*).
- Treatment of contacts of MRSA-colonized people is not always useful (from 80% to 60% *important*).

Table 11: Round three evaluation of newly suggested MRSA items.

	Overall N=20 modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
What is MRSA					
- The only difference between MSSA and MRSA is that MRSA is resistant against Methicillin (an antibiotic).	I (45%)	I (50%)	U-N (40%)	U (67%)	I (100%)
- There are three different types of MRSA: hospital associated MRSA, livestock associated MRSA and community associated MRSA.	I (50%)	I (75%)	N (60%)	U (50%)	I (80%)
- Problems with hospital associated MRSA differ from problems with community associated MRSA.	I (50%)	N-I (50%)	N-I (40%)	N (67%)	I (80%)
- Community associated MRSA does not necessarily cause any problems but may pose a threat on healthy people.	I (60%)	I (75%)	N (80%)	N-I (50%)	I (100%)
Consequences					
- MRSA-colonization is not the patient's fault.	I (80%)	I (75%)	I (80%)	I (83%)	I (80%)
Risk factors					
- Orally taken medication causes less risk of a MRSA-infection then intravenous medication.	U (55%)	U (75%)	U (60%)	U (83%)	I (80%)
Treatment					
- MRSA *can* be treated via specific antibiotics and decolonization.	I (90%)	I (100%)	I (100%)	I (67%)	I (100%)
- In case of known MRSA-colonization a patient can be treated prior to surgery.	I (70%)	I (75%)	I (100%)	N (83%)	I (100%)
- Treatment (decolonization) cannot preventively be applied to anyone with increased risk of MRSA-colonization.	N (45%)	I (50%)	N-I (40%)	U-N (50%)	N (60%)
MRSA and pregnancy					
- There is no increased chance of complications, miscarriage or consequences for the baby when a pregnant woman is colonized with MRSA.	I (70%)	I (75%)	I (80%)	I (67%)	I (60%)
- A MRSA-infection during pregnancy/delivery increases the risk of infections or other disorders.	I (50%)	N (50%)	I (60%)	- (33%)	I (80%)
- It is important to wash hands and keep pump equipment very clean for breast feeding.	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
Contacts of a MRSA-colonized person					
- MRSA-colonization is not always dangerous for contacts, except for if they already have an increased risk (due to skin disorders or poor health).	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
- Treatment of contacts of MRSA-colonized people is not always useful.	I (75%)	I (75%)	I (80%)	I (83%)	I (60%)
- People must be well informed about what they should do if a family member is infected with community associated MRSA.	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)

Table 12: Round three re-evaluation of newly suggested antibiotic use items.

Items	Overall N=20 modus (% with that score)	CM N=4 modus (% with that score)	ICP N=5 modus (% with that score)	HSO N=6 modus (% with that score)	P N=5 modus (% with that score)
Limited antibiotics use					
- Patients should not use antibiotics which were not prescribed to them.	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)
- Patients should not ask their general practitioner for antibiotics, since he/she might then feel pressure to prescribe them.	I (70%)	I (75%)	I (80%)	I (50%)	I (80%)
- Hospitalized patients can politely question the necessity of using antibiotics for them.	I (95%)	I (100%)	I (80%)	I (100%)	I (100%)
- Alternatives for antibiotics should always be considered for treatment.	I (80%)	I (75%)	I (80%)	I (67%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals, HSO → Health Service Organization employees, P → Patients.

I → Important, N → Neutral, U → Unimportant

Re-evaluation of information sources. The information sources were re-evaluated in round three of the Delphi. A total of 20 MRSA information sources and 17 ASP information sources where re-evaluated. An overview of the evaluation of these items is given in Table 13 and Table 14. The entire group of stakeholders reached consensus on two MRSA information sources (10,0%) and one ASP information source (5,9%). Boxplots of these items are given in Appendix H. The items were all considered important:

- The patients medical doctor as an information source for MRSA.
- Nursing staff is an information source for MRSA.
- Pharmacies are an information source for ASP.

Between groups. Consensus within the subgroups was higher. The clinical microbiologists agreed on 11 MRSA information sources (55,0%) and nine ASP information sources (52,9%). They rated most information sources as being important for the general public. Besides the items that all stakeholders agreed on, the consensus items are given below.

MRSA:
- Folders from infection prevention departments in hospitals are an information source for MRSA
- The government (via 'postbus 51' initiatives) is an information source for MRSA
- Newspapers are an information source for MRSA
- Several television broadcasts are an information source for MRSA
- Posters in hospitals are an information source for MRSA
- The internet in general is an information source for MRSA
- www.mrsa-net.nl is an information source for MRSA
- www.ggd.nl is an information source for MRSA
- www.wikipedia.nl is an information source for MRSA
- Health service organizations are an information source for MRSA
- Infection control professionals are an information source for MRSA

Antibiotics use:
- Too little information is available on antibiotic use
- Folders from infection prevention departments in hospitals are an information source for ASP
- Newspapers are an information source for ASP
- Several television broadcasts are an information source for ASP
- Package leaflets of antibiotics are an information source for ASP
- The government (via 'postbus 51' initiatives) is an information source for ASP
- The internet in general is an information source for ASP
- ecdc.europa.eu is an information source for ASP
- Nursing staff is an information source for ASP

The clinical microbiologists also rated information sources as being neutrally important for the general public:

MRSA:
- www.ggd.nl is an information source for MRSA

Antibiotics use:
- ecdc.europa.eu is an information source for ASP

The infection control professionals agreed on 12 MRSA information sources (60,0%) and 11 ASP information sources (64,7%). They rated most items as being important information sources for the general public. Besides the items that all stakeholders agreed on, the consensus items are given below.

MRSA:
- The government (via 'postbus 51' initiatives) is an information source for MRSA
- Several television broadcasts are an information source for MRSA
- Internet in general is an information source for MRSA
- Internet forums are an information source for MRSA
- www.rivm.nl/MRSA is an information source for MRSA
- www.rivm.nl/cib is an information source for MRSA
- www.mrsa-net.nl is an information source for MRSA
- www.ggd.nl is an information source for MRSA
- Health service organizations are an information source for MRSA
- Infection control professionals are an information source for MRSA

Antibiotics use:
- Too little information is available on antibiotic use
- Patients should be stimulated to read more information about ASP
- Several television broadcasts are an information source for ASP
- Package leaflets of antibiotics are an information source for ASP
- The government (via 'postbus 51' initiatives) is an information source for ASP
- www.rivm.nl/cib is an information source for ASP
- www.mrsa-net.nl is an information source for ASP
- Nursing staff is an information source for ASP
- Health service organizations are an information source for ASP

The infection control professionals rated one item as being of neutral importance on the five point Likert scale:

- Additional informational sources for antibiotics use are not needed

The health service organization employees agreed on eight MRSA information sources (40,0%) and four ASP information sources (23,5%). They rated most information sources as being important. Besides the items that all stakeholders agreed on, the consensus items are given below.

MRSA:

- Folders from infection prevention departments in hospitals are an information source for MRSA
- www.rivm.nl/cib is an information source for MRSA
- www.mrsa-net.nl is an information source for MRSA
- Health service organizations are an information source for MRSA

Antibiotics use:

- Newspapers are an information source for ASP
- Several television broadcasts are an information source for ASP
- www.rivm.nl/cib is an information source for ASP

The health service organization employees rated two items as being neutrally important:

- www.ggd.nl is an information source for MRSA
- Additional information sources on antibiotics use for the general public are not needed

The health service organization employees rated one item as being unimportant:

- www.wip.nl is an information source for MRSA

The (former) MRSA-patients agreed on 17 MRSA information sources (85,0%) and 16 ASP information sources (94,1%). They rated all items as being important information sources for the general public. Besides the items that all stakeholders agreed on, the consensus items are given below.

MRSA:

- Folders from infection prevention departments in hospitals are an information source for MRSA
- Newspapers are an information source for MRSA
- Posters in hospitals are an information source for MRSA
- The internet in general is an information source for MRSA
- Internet forums are an information source for MRSA
- www.rivm.nl/MRSA is an information source for MRSA
- www.rivm.nl/cib is an information source for MRSA
- www.wip.nl is an information source for MRSA
- www.mrsa-net.nl is an information source for MRSA
- www.google.nl is an information source for MRSA
- www.ggd.nl is an information source for MRSA
- www.wikipedia.nl is an information source for MRSA
- Health service organizations are an information source for MRSA
- Infection control professionals are an information source for MRSA
- Pharmacies are an information source for MRSA

Antibiotics use:

- Too little information is available on antibiotic use
- Patients should be stimulated to read more information about ASP
- Folders from infection prevention departments in hospitals are an information source for ASP
- Newspapers are an information source for ASP
- Several television broadcasts are an information source for ASP
- Package leaflets of antibiotics are an information source for ASP
- The government (via 'postbus 51' initiatives) is an information source for ASP
- The internet in general is an information source for ASP
- www.eursafety.eu is an information sources for ASP
- www.rivm.nl/cib is an information source for ASP
- www.google.nl is an information source for ASP
- www.mrsa-net.nl is an information source for ASP
- Nursing staff is an information source for ASP
- Health service organizations are an information source for ASP

*Comparison with prior Delphi round***.** Again a comparison is made between the current round of the Delphi and the prior round. This is done to provide an overview of striking changes from consensus to non-consensus. The clinical microbiologists changed their opinions from consensus to non-consensus six times for MRSA information sources (30,0%) and seven ASP information sources (35,3%). The changed items are:

- Internet forums are an information source for MRSA (from 100% *important* to 50% *neutral-important)*
- www.rivm.nl/MRSA is an information source for MRSA (from 67% *important* to 50% *neutral-important)*
- www.rivm.nl/cib is an information source for MRSA (from 67% *important* to 50% *neutral-important)*
- www.wip.nl is an information source for MRSA (from 67% un*important* to 50% *unimportant-neutral)*
- www.google.nl is an information source for MRSA (from 67% *important* to 50% *neutral-important)*
- www.eursafety.eu is an information sources for MRSA (from 67% *important* to 50% *neutral-important)*
- Additional information sources on antibiotics use for the general public are not needed (from 100% *unimportant* to 50% *neutral*)
- Patients should be stimulated to read more information about ASP (from 100% *important* to 50% *neutral-important*)
- www.eursafety.eu is an information sources for ASP (from 100% *important* to 50% *neutral-important*)
- www.rivm.nl/cib is an information source for ASP (from 67% *important* to 50% *neutral-important*)
- www.google.nl is an information source for ASP (from 67% *neutral* to 50% *neutral-important*)

- www.mrsa-net.nl is an information source for ASP (from 67% *important* to 50% *neutral-important*)
- Health service organizations are an information source for ASP (from 67% *neutral* to 50% *neutral-important*)

The infection control professionals only changed their opinions from consensus to non-consensus for three MRSA information sources (15,0%). These items are:

- Folders from infection prevention departments in hospitals are an information source for MRSA (from 100% to 60% *important*)
- Posters in hospitals are an information source for MRSA (from 80% to 60% *neutral*)
- Pharmacies are an information source for MRSA (from 80% 60% *important*)

The health service organization employees changed their opnions from consensus to non-consensus for one MRSA information source (5,0%) and two ASP information sources (11,8%).

- www.rivm.nl/MRSA is an information source for MRSA (from 83% to 67% *important*)
- Patients should be stimulated to read more information about ASP (from 83% *neutral* to 50% *neutral*)
- Nursing staff is an information source for ASP (from 83% 67% *important*)

The patients changed their opinions from consensus to non-consensus for one MRSA information source.

- The government (via 'postbus 51' initiatives) is an information source for MRSA (from 80% to 60% *important*)

Table 13: Round three evaluation of suggested scources of information about MRSA.

Items	**Overall N=20** modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
- Folders from infection prevention departments in hospitals.	I (80%)	I (75%)	I (60%)	I (83%)	I (100%)
- The government (via 'postbus 51' initiatives).	I (55%)	I (75%)	I (80%)	N (67%)	I (60%)
- Newspapers.	I (50%)	I (75%)	U-N (40%)	U (50%)	I (80%)
- Several television broadcasts .	I (65%)	I (75%)	I (80%)	I (50%)	I (60%)
- Posters in hospitals.	I (60%)	I (75%)	N (60%)	N (50%)	I (100%)
- The internet in general.	I (70%)	I (75%)	I (80%)	I (50%)	I (80%)
- Internet forums	I (65%)	N-I (50%)	I (80%)	- (33%)	I (100%)
- www.rivm.nl/MRSA	I (80%)	N-I (50%)	I (100%)	I (67%)	I (100%)
- www.rivm.nl/cib	I (80%)	N-I (50%)	I (100%)	I (83%)	I (80%)
- www.wip.nl	U (45%)	U-N (50%)	I (60%)	U (83%)	I (80%)
- www.MRSA-net.nl	I (90%)	I (75%)	I (100%)	I (83%)	I (100%)
- www.google.nl	I (60%)	N-I (50%)	I (60%)	I (50%)	I (80%)
- www.eursafety.eu	I (40%)	N-I (50%)	I (60%)	U (50%)	N-I (40%)
- www.ggd.nl	I (50%)	N (100%)	I (100%)	N (83%)	I (100%)
- www.wikipedia.nl	I (55%)	I (75%)	N (60%)	U (50%)	I (100%)
- The patient's medical doctor	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)
- Nursing Staff	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
- HSO	I (90%)	I (75%)	I (80%)	I (100%)	I (100%)
- Infection control professional	I (85%)	I (100%)	I (100%)	I (50%)	I (100%)
- Pharmacies	I (45%)	N (50%)	I (60%)	U-N (50%)	I (100%)

Table 14: Round three evaluation of suggested sources of information on antibiotic use.

Items	**Overall N=20** modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
- Too little information is available on antibiotic use.	I (70%)	I (75%)	I (80%)	- (33%)	I (100%)
- Patients should be stimulated to read more information about antibiotics use.	I (60%)	N-I (50%)	I (80%)	N (50%)	I (100%)
- Additional information sources on antibiotics use for the general public are not needed.	N (65%)	N (50%)	N (80%)	N (83%)	N-I (40%)
- Folders from infection prevention departments in hospitals.	I (60%)	I (75%)	N-I (40%)	- (33%)	I (100%)
- Newspapers.	I (65%)	I (75%)	N-I (40%)	I (83%)	I (80%)
- Several television broadcasts.	I (85%)	I (75%)	I (100%)	I (67%)	I (100%)
- Package leaflets of medication.	I (90%)	I (75%)	I (80%)	I (100%)	I (100%)
- The government (via 'postbus 51' initiatives).	I (70%)	I (75%)	I (80%)	- (33%)	I (100%)
- The internet in general	I (55%)	I (75%)	I (60%)	U (50%)	I (80%)
- www.eursafety.eu	I (50%)	N-I (50%)	I (60%)	U (50%)	I (80%)
- www.rivm.nl/cib	I (80%)	N-I (50%)	I (100%)	I (83%)	I (80%)
- www.google.nl	I (60%)	N-I (50%)	I (60%)	I (50%)	I (80%)
- www.MRSA-net.nl	I (70%)	N-I (50%)	I (80%)	I (50%)	I (100%)
- ecdc.europa.eu	N (50%)	N (75%)	N (60%)	U (67%)	I (60%)
- Nursing staff	I (80%)	I (75%)	I (80%)	I (67%)	I (100%)
- HSO	I (75%)	N-I (50%)	I (80%)	I (67%)	I (100%)
- Pharmacies	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)

Overarching categories. Besides the individual MRSA and ASP items that where included in the delphi, overarching categories of items were included in the third round. These categories were not a result of a literature study but where formulated via a card sort (as described in the Methods section of this study). A total of 16 overarching categories where formulated and Delphi participants where asked to rate how important it is that the general public has some knowledge regarding the category. An overview of the evaluation of these categories is given in Table 15. The entire group of stakeholders reached consensus on four categories (25,0%). Boxplots of these categories are given in Appendix H. The items were all considered important:

- General knowledge on what MRSA is.
- Knowledge on what to do when a contact or housemate is MRSA-colonized.
- Knowledge on risks of antibiotics (resistance).
- Knowledge on what people can/should do to prevent resistance.

Between groups. Consensus within the subgroups was mostly much higher. The clinical microbiologists reached consensus on 15 overarching categories (93,8%). Almost all consensus categories were considered important. Besides the categories that all stakeholders agreed on, these categories where:

- Knowledge on the origin of MRSA.
- Knowledge on risk factors for MRSA.
- Knowledge on treatment of MRSA.
- Knowledge on the spread of MRSA.
- Knowledge on measures to limit the spread of MRSA.
- Knowledge on the consequences of MRSA.
- Knowledge on feelings of guilt with MRSA.
- Knowledge on what people can/should do themselves to limit the spread of MRSA.
- Knowledge on measures to prevent antibiotics resistance.
- Knowledge on where people can find reliable information about MRSA and antibiotics.

The clinical microbiologists rated one category as being of neutral importance on the five point Likert scale:

- Knowledge on how antibiotics work.

The infection control professionals agreed on 13 overarching categories (81,3%). They rated all consensus items as being important knowledge for the general public. Besides the categories that all stakeholders agreed on, these categories where:

- Knowledge on the origin of MRSA.
- Knowledge on risk factors for MRSA.
- Knowledge on treatment of MRSA.
- Knowledge on the spread of MRSA.
- Knowledge on measures to limit the spread of MRSA.
- Knowledge on feelings of guilt with MRSA.
- Knowledge on what people can/should do themselves to limit the spread of MRSA.
- Knowledge on measures to prevent antibiotics resistance.
- Knowledge on where people can find reliable information about MRSA and antibiotics.

The health service organization employees agreed on only six overarching categories (37,5%). They rated these consensus categories as being important knowledge for the general public. Besides the categories that all stakeholders agreed on, these categories where:

- Knowledge on measures to prevent antibiotics resistance.
- Knowledge on where people can find reliable information about MRSA and antibiotics.

The patients agreed on 15 overarching categories (93,8%). They rated all consensus categories as being important knowledge for the general public. Besides the categories that all stakeholders agreed on, these categories where:

- Knowledge on the origin of MRSA.
- Knowledge on risk factors for MRSA.
- Knowledge on treatment of MRSA.
- Knowledge on the spread of MRSA.
- Knowledge on measures to limit the spread of MRSA.
- Knowledge on the consequences of MRSA.
- Knowledge on MRSA and pregnancy.
- Knowledge on what people can/should do themselves to limit the spread of MRSA.
- Knowledge on measures to prevent antibiotics resistance.
- Knowledge on where people can find reliable information about MRSA and antibiotics.

Table 15: Round three evalutation of overarching categories

Delphi item-categories	**Overall N=20** modus (% with that score)	**CM N=4** modus (% with that score)	**ICP N=5** modus (% with that score)	**HSO N=6** modus (% with that score)	**P N=5** modus (% with that score)
- General knowledge on what MRSA is.	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
- Knowledge on the origin of MRSA.	I (75%)	I (75%)	I (80%)	I (67%)	I (80%)
- Knowledge on risk factors for MRSA.	I (80%)	I (100%)	I (80%)	I (50%)	I (100%)
- Knowledge on treatment of MRSA.	I (70%)	I (75%)	I (80%)	- (33%)	I (100%)
- Knowledge on the spread of MRSA.	I (75%)	I (75%)	I (80%)	I (50%)	I (100%)
- Knowledge on measures to limit the spread of MRSA.	I (70%)	I (75%)	I (80%)	N (50%)	I (100%)
- Knowledge on the consequences of MRSA.	I (80%)	I (100%)	I (60%)	I (67%)	I (100%)
- Knowledge on feelings of guilt with MRSA.	I (60%)	I (75%)	I (80%)	N (50%)	I (60%)
- Knowledge on MRSA and pregnancy.	I (60%)	N-I (50%)	I (60%)	N (67%)	I (100%)
- Knowledge on what people can/should do themselves to limit the spread of MRSA.	I (75%)	I (75%)	I (80%)	I (50%)	I (100%)
- Knowledge on what to do when a contact or housemate is MRSA-colonized.	I (95%)	I (100%)	I (100%)	I (83%)	I (100%)
- Knowledge on the way antibiotics work.	I (65%)	N (75%)	I (60%)	I (67%)	I (100%)
- Knowledge on risks of antibiotics (resistance).	I (100%)	I (100%)	I (100%)	I (100%)	I (100%)
- Knowledge on measures to prevent antibiotics resistance.	I (85%)	I (75%)	I (80%)	I (83%)	I (100%)
- Knowledge on what people can/should do themselves to prevent antibiotic resistance.	I (95%)	I (100%)	I (80%)	I (100%)	I (100%)
- Knowledge on where people can find reliable information about MRSA and antibiotics.	I (90%)	I (75%)	I (100%)	I (83%)	I (100%)

CM → Clinical Microbiologists, ICP → Infection Control Professionals,

HSO → Health Service Organization employees, P → Patients

I → Important, N → Neutral, U → Unimportant

4.1.4 Education and guidelines

The second part of the first sub-question of this study was: What are implications of the results for infection prevention and –control education and guidelines? Already, reliable sources of information exist on the internet, but they might not match the needs for knowledge of the general public. Application of such information sources would be ineffective. Examples of perhaps the most relevant existing information sources in the Netherlands are National Coordination Infections (LCI: Landelijke Coördinatie Infectieziekten), Workgroup infection prevention (WIP: Werkgroep Infectiepreventie) and Foundation Workgroup Antibiotics policy (SWAB: Stichting Werkgroep Antibioticabeleid). They have have developed national guidelines for MRSA and antibiotic use (LCI, 2011; SWAB, 2007; WIP, 2008). These are compared to the results of the Delhpi. An overview of this comparison is given in Table 16.

First of all, some differences between the national guidelines and the Delphi outcomes are obvious. Whereas the guidelines are aimed at professionals working in a clinical setting, the Delphi is aimed at individuals in the general public in everyday life and as patients. The national guidelines do not cover any of the topics that involve participation of patients in the care process, which Delphi respondents do consider important. These are:

- What can/should people do themselves to limit the spread of MRSA (no consensus reached among health service organization employees).
- What should people do when a contact or housemate is MRSA-colonized.
- What can/should people do themselves to prevent antibiotic resistance.
- Where can people find reliable information about MRSA and antibiotics.

Also, the national guidelines do not cover social-emotional topics, that stakeholders again do consider important. Specifically feelings of guilt about MRSA-colonization are not covered in the guidelines although they are rated as being important by clinical microbiologists and infection control professionals, MRSA and pregnancy is not covered in the guidelines although it is considered important by the patients. Other topics that none of the guidelines cover are the risks of antibiotics use (which is unanimously rated as being important information by the stakeholders), the way antibiotics work[1] (which is rated important by the patient and clinical microbiologists) and measures that can be taken to prevent antibiotics resistance (which is considered important by all stakeholder groups). The WIP guideline does not explicitly cover the topic of consequences of MRSA, this is done by the guidelines of LCI and SWAB and is considered important by the patients and clinical micriobiologists in the Delphi. There are items that are included in all national guidelines and are considered important by all stakeholder groups except the health service organization employees: Origins of MRSA, riskfactors for MRSA, treatment of MRSA, spread of MRSA and measures to limit the spread of MRSA. One item is covered by all national guidelines and is cosidered important by all stakeholder groups: General knowledge on what MRSA is.

As stated before, prior research and the current study have shown that a translation from the clinical and technical information in the guidelines to understandable information for patients is needed. This is why the MRSA-net project developed the website www.mrsa-net.nl (Verhoeven, et al., 2008; Wentzel, et al., 2011). The overarching categories of items are compared to the categories of items that are used on the website. An overview of this comparison is given in Table 16. It appears that the Delphi covers most categories of the website (although they might be named or grouped slightly different): General knowledge on what MRSA is, origins-, riksfactors-, treatment- and spread of MRSA, measures to prevent the spread, MRSA and pregnancy, what patients can do themselves to prevent the spread of MRSA and when a contact is MRSA-colonized and where to find reliable information. Furthermore there are some items that the Delphi did not cover but both the website and the national guidelines do: MRSA and my profession is mentioned by all guidelines and MRSA in the Netherlands is covered in the WIP and LCI guidelines. Since these topics where not included in the Delphi, no ratings from the stakeholders are known.

[1] It should be noted that both the way antibiotics work and its risks are mentioned in the SWAB guideline, but this only concerns the technical clinical aspects, which would be of no use to patients. Therefore these topics are not considerd adequately covered in this analysis.

Table 16: Coverage of Delphi items on mrsa-net and in national guidelines.

Delphi item-categories	MRSA-net categories	WIP guideline	LCI guideline	SWAB guideline
General knowledge on what MRSA is.	MRSA in general	+	+	+
Origins of MRSA.	Getting colonized with MRSA Animals and pigfarms	+	+	+
Risk factors for MRSA.	Getting colonized with MRSA	+	+	+
Treatment of MRSA.	Treatment	+	+	+
Spread of MRSA.	Getting colonized with MRSA	+	+	+
Measures to limit the spread of MRSA.	Testing Hygiene and cleaning	+	+	+
Consequences of MRSA.	MRSA in general		+	+
Feelings of guilt with MRSA.				
MRSA and pregnancy.	Pregnancy and baby			
What can/should people do themselves to limit the spread of MRSA.	In the hospital			
What should people do when a contact or housemate is colonized with MRSA.	Contact with others			
The way antibiotics work.				
Risks of antibiotic use (resistance).				
Measures to prevent antibiotic resistance.				
What can/should people do themselves to prevent antibiotic resistance.				
Where people can find reliable information about MRSA and antibiotics.	Contact for questions about MRSA			
	MRSA and my profession	+	+	+
	The Netherlands and other countries	+	+	

4.1.5 Subquestion 1 in sum

First part of the first subquestion was: What knowledge on MRSA and antibiotic use and what skills does the general public need to enable participation in infection prevention and –control in a cross-border setting? This research question is answered via a Delphi study.

In summary the Delhpi study has proven that some knowledge on MRSA is necessary to enable patient participation in infection prevention and –control in a cross-border setting. With these items, most overarching categories are covered except for: knowledge on the origin of MRSA, on the treatment of MRSA, on the spread of MRSA and on feelings of guilt caused by MRSA. This knowledge should be provided via education of the general public:

- One can be colonized with MRSA without becoming ill.
- Patients who have recently been admitted to a hospital abroad, may be treated in isolation in a Dutch hospital.
- Patients who have recently been admitted to a hospital abroad must immediately report so upon being admitted to a Dutch hospital, to enable screening for MRSA-colonization.
- Patients who work with livestock short report so upon admission to a Dutch hospital, so they can be screened for MRSA-colonization.
- Patients who are colonized with MRSA should be treated in isolation in the hospital.
- A recent hospitalization abroad increases the risk of MRSA-colonization.
- MRSA-colonization is not always dangerous for contacts, except for if they already have an increased risk (due to skin disorders or poor health).
- People must be well informed about what they should do if a family member is infected with community associated MRSA.
- It is important to wash one's hands and keep pump equipment very clean for breast feeding.

Additionally some knowledge on antibiotics use is necessary to enable patient participation in infection prevention and –control in a cross-border setting. With these items two of the four overarching categories are covered: knowledge on risks of antibiotics (resistance) and on what people can/should do themselves to prevent antibiotic resistance. This knowledge should, according to the Delphi participants, also be provided in education of the general public:

- When too much antibiotics are used increasingly many resistant bacteria will develop.
- When too much antibiotics are used, they are less likely to work as well in the future.
- Bacteria can become resistant to antibiotics.
- Patients should not use antibiotics which were not prescribed to them.
- Hospitalized patients can politely question the necessity of using antibiotics for them.
- Patients themselves are responsible for using antibiotics according to their prescription, including after leaving the hospital.

Overall, some overarching categories of items were considered important for the general public. This means the Delphi respondents thought the general public should have some knowledge on the topics:

- General knowledge on what MRSA is.
- Knowledge on what to do when a contact/housemate is MRSA-colonized.
- Knowledge on risks of antibiotics (resistance).
- Knowledge on what people can/should do to prevent resistance.

Finally, in recognition of the fact that it is impossible for the general public to know all there is to know about MRSA and antibiotics use, it is considered important that they know where they could acquire reliable information. Important souces of information are:

- The general practitioner as an information source for MRSA.
- The patients medical doctor as an information source for MRSA.
- Nursing staff is an information source for MRSA.
- The patients medical doctor as an information source for ASP.
- The general practitioner as a source of information for ASP.
- The medical specialist as a source of information for ASP.
- Pharmacies are an information source for ASP.

Second part of the first research question was: What are implications of the results for infection prevention and –control education and guidelines? First of all it might be interesting to compare the changes in opinions of the different stakeholders over the different rounds. The clinical microbiologists changed their opinions from consensus to non-consensus a total of 18 times. This mainly happened in the third round for information sources for MRSA and antibiotic use (13 times), specifically for internet sources (10 times). The infection control professionals changed their opinions from consensus to non-consensus a total of 14 times. Half of these took place in the second round and concerned the existing MRSA and ASP knowledge items. The health service organization employees changed their opinions from consensus to non-consensus a total of 10 times. Seven of these concerned existing MRSA and ASP items in round two (four times) and round three (three times). The patients also changed their opinions from consensus to non-consensus 10 times. Half of these took place in the third round and concerned the existing MRSA and ASP knowledge items.

Additionally, to answer this question, the Delphi results where compared with existing national guidelines. In sum, this comparison has shown that topics concerning socio-emotional and patient participation issues are not covered in the national guidelines. Furthermore, no information is given in any of the guidelines on how antibiotics work, what the risks of antibiotics are or measures to prevent antibiotic resistance. This is probably since the authors assume that this is basic knowledge for the healthcare workers (for whom the guidelines are written). Agreement in categories covered on the website www.mrsa-net.nl and in the Delphi are greater, they are both aimed at the general public.

4.2 Sub-question 2: Participation via ePanel

First part of this sub-question was: What is the definition of an ePanel? A definition of an ePanel is formulated based on the literature study that is described in the theoretical framework. The definition of an ePanel that is based on literature and is used in this study is:

> *"An ePanel is an online virtual community, which consists of pre-recruited individuals, with the goal of allowing them to easily participate in the measurement of knowledge or attitudes on any number of topics via online research methods".*

4.2.1 Organizing a representative ePanel

Second part of the second sub-question of this study was: How should an ePanel be organized to ensure that it is representative of the general public? The results to answering this question discussed in this paragraph are based on the literature study that is discussed in the Theoretical framework.

What factors associated with recruitment influence the panel's scientific quality? This research questions is answered via several sub-questions. It is discussed who should be represented in the ePanel, how participants should be recruited and whether or not participants should receive financial compensation.

Who should be represented in the ePanel? To achieve the best possible generalizability, the panel members should largely match the demographic characteristics and Social Economic Status (SES) of the general population in the border region. Demographic characteristics to be considered are for example age and gender. There are three important SES indicators that are related to health differences, and might therefore be relevant: Level of education, profession and income (Kardal & Lodder, 2008).

How should participants be recruited? Research has shown that participants are best recruited through e-mail (as opposed to flyers, fax and letters). E-mails where most successfully delivered and achieved the highest participation rate (Göritz, 2004b). These e-mails were best used in a probabilistic sampling strategy, to accomplish the best representation of the general public. However, since 'only' 95% of Dutch internet users also use it to send or receive e-mails, some part of the general public will be excluded from participation via this recruitment strategy (CBS, 2011). The excluded individuals may demographically differ from the participating individuals.

Many people are motivated to participate by the knowledge functional source (participation is a means for the individual to gain information), the value-expressive functional source (participation is an opportunity to express self-concepts or values) or a sense of community (participation would mean being part of a group).

To reach the highest possible rate of participation, an invitation to participate should first of all appeal to the knowledge functional source. In other words it should be emphasized that participating would be a means for the individual to gain information (or: to fulfill their need for cognition). Secondly, an invitation should appeal to the value-expressive functional source. This implies that it should be made clear that participating would be an opportunity for the individual to express their self-concepts or values (Daugherty, et al., 2005).

Should participants in the ePanel receive financial compensation? The effect of incentives on data quality and drop-out is still largely unknown. The little existing literature has shown that offering an incentive does indeed improve the participation rate. However, the type of incentive should be well considered. A guaranteed incentive has a larger positive effect on high participation and low drop-out rates than for instance a lottery. Attention must be given to the possible danger of attracting a certain population by choosing an incentive system and the size of the incentive. At the same time, researchers can use this knowledge by tailoring the incentives to attract a certain target population. Besides the risk of attracting a certain population, offering incentives also poses the risk of attracting 'incentive-hunters': Individuals who may try to fill out multiple surveys or rush through them to get to the incentive (Batinic, et al., 2000). Overall, an equilibrium must be found between ensuring the readiness to (continuously) participate and discouraging incentive-hunters (Göritz, 2004a).

What factors associated with data collection influence the ePanel's scientific quality? Advantage of using an ePanel for online surveys, as opposed to face-to-face or telephone interviews, is that interviewers might influence responses during their conversation. Interviewees may respond in accordance with what they believe to be the 'correct' replies. Additionally, respondents could feel embarrassed towards the interviewer in some of their answers. Finally, in using questionnaires instead of an interviewer, each responder receives the same set of questions phrased in exactly the same way, so the answers are derived in a more objective way (Panagakou et al., 2009).

Most ePanels are characterized by the fact that members remain in the panel for a longer period and therefore participate in multiple surveys. Several studies have focused on what effect this repeated participation has on the respondents. It is suggested that the behavior of respondents may change as a consequence of their mere participation in an ePanel (Batinic, et al., 2000; Dennis, 2001). This is especially relevant when the ePanel members participate in multiple surveys on a single topic.

Another consequence of the repeated participation of ePanel members and the fact that it operates online is the risk of security bias. Participants fill out some personal data and since they are likely to log on to the survey using a personalized account, data collection is not completely anonymous. In combination with the individuals' growing awareness of privacy issues, this may lead to decreased response rates (Batinic, et al., 2000).

What factors associated with data analysis influence the ePanel's scientific quality? It is extremely important to monitor the scientific value of the ePanel via analysis of the demographic characteristics of both respondents and drop-out respondents. Demographic characteristics of respondents should be monitored to be able to measure the existence of selection bias (participants may for a multitude of reasons be more interested in the study subject, which threatens external validity), panel bias (participants may learn and adjust their behavior during participation, which threatens internal and external validity) and drop-out (these drop-out panel members may differ from the remaining panel members) (Batinic, et al., 2000; Dennis, 2001).

What study methods can be applied to ePanels (focusgroup, survey etc)? In existing literature ePanels are only used in online survey studies. Several questionnaires are known and used to measure knowledge on MRSA and antibiotic use. None of these exactly match the aims of the current study. They can however be used as a reference point on how to construct a questionnaire.

Lindberg et al have developed a questionnaire called 'The Multidrug-Resistant Bacteria (MDRB) Attitude Questionnaire' (Lindberg, Skytt, Högman, & Carlsson, 2011). This questionnaire is used to measure knowledge, behaviour and emotional responses in healthcare workers (Lindberg, et al., 2011). Thus, it differs from the current study. It consists of (1) a knowledge component with 18 items covering the areas of: Spread of infection, treatment, microbiological characteristics and hygiene precautions in relation to MRSA and ESBL-producing bactiera. (2) The behaviour component contains ten items and (3) the emotional response component consists of 14 items measuring emotional responses to caring for patients with a culture positive for MRSA. It is therefore also suitable to identify areas requiring education among healthcare workers. Both content validity (Kaiser-Meyer-Olkin's = 0,90) and internal consistency (Cronbach's Alpha = 0,89) were found satisfactory, even though further research is still needed (Lindberg, et al., 2011).

In a Greek study a questionnaire was developed and assessed to measure parents' knowledge, attitudes towards and practices concerning antibiotic use in their children (Panagakou, et al., 2009). Thus it differs from the current study in that it focuses on parents of (potential) patients in stead of on (potential) patients themselves. The questionnaire consists of a total of 58 items, which are scored through a 5-point Likert scale. Similar and contradictive questions on the same item are used to ensure internal validity. This made it possible to make a judgement on how well the questionnaires were answered and 2.5% of them appeared to be inadequately answered. Internal consistency of the items was 0.68 (Cronbach's Alpha) (Panagakou, et al., 2009).

4.2.2 Case: EPECS ePanel

Last part of the second sub-question of this study was: How is the general public currently participating through EPECS? This case is aimed at illustrating an application of the theoretical organization of an ePanel. The case is based on an interview with one of the founders of EPECS. Overall it is important to realize that EPECS is entirely run by and dependent on volunteers. These volunteers often have a day job in a patient organization and very much believe in the importance of the EPECS ePanel, but have limited time available to spend working on it.

What is the goal of EPECS' ePanel for MRSA? The main purpose of EPECS' ePanel is to provide the general public with an opportunity to think along in cross-border European healthcare. EPECS finds it important to involve the general public in decision making on this topic, so that for instance policy makers do "not only talk *about* the general public, but talk *with* the general public". To do so, it is important to EPECS that the general public's opinion is not only asked but also heard. Therefore they strive to inform politicians in Brussels or other relevant organizations on their findings.

How are the members of EPECS' ePanel for MRSA recruited? EPECS uses several methods to recruit new members for their ePanel. First, fliers are printed in the Dutch, French and German language, with courtesy of the euPrevent project. These are placed in for instance hospitals that EPECS comes in contact with. However, this strategy has thus far mainly been applied to the region Maas-Rijn (in the south of the Netherlands), where fliers have also been send to General Practitioners and placed in their practices so that any visitor could join the ePanel. Attempts in other regions have thus far been less successful. Second, attempts have been made to involve media in the recruitment, by asking press to cover activities organized by EPECS. Thus far, getting media coverage has, apart from some small articles in 'Nederlands Tijdschrift voor Verpleegkundigen' (a Dutch scientific journal for nurses) and some local newspapers, not been very successful. Third, EPECS is seeking cooperation with other organizations, such as the 'Zorgloket' (a Dutch organization which offers information and advice on healthcare, living and wellbeing) and 'Royal Doctors' (a Belgian/Dutch organizations which advices patients to attaining the best possible care). EPECS has no insight in how successful the individual recruitment strategies have been. Due to the fact that EPECS is still very much in a developing stage of the ePanel recruitment, the reason for EPECS to utilize these methods for the recruitment is the mere availability or unavailability of resources and the willingness of external parties to contribute. EPECS does not offer any incentive for participating in the ePanel, simply since it has no funds to do so.

Who participate in EPECS' ePanel for MRSA? The current EPECS ePanel exists of a total of 76 participants who are recruited by EPECS. Furthermore the 'Huis voor de Zorg' (an independent Dutch organization for healthcare users in Limburg) has incorporated their existing ePanel into the EPECS ePanel, which consisted of a total of 512 individuals. This brings the total EPECS ePanel to 588 panel members (in January 2012). Due to merging these two ePanels, it is known that by far the most panel members are Dutch (94,9%) and more specifically live in a single provence (Limburg). Also, the majority of participants (69,6%) was born before 1950. This will negatively affect the generalizability of the ePanel. EPECS therefore strives to a much larger ePanel.

How does EPECS' ePanel for MRSA function? Although the EPECS ePanel is still in the founding stage, there are some things to be said about its future plans, particularly their ideas on data collection and –analysis. This is discussed below. Due to the amount of time volunteers can spend on their work for EPECS it is not feasible for EPECS to work with any research method other then online surveys and an occasional round table meeting.

Data collection. EPECS has not yet completed this stage. It is known that topics to be covered by the ePanel are determined by EPECS. Topics could cover any aspects of cross-border European healthcare, for instance MRSA but also obesity in cross-border settings. Development of the questionnaires is then left to Universities (of Twente, Groningen and Münster). Ultimately the questionnaires should be developed by students, since

EPECS has practically no resources. EPECS wants to let the involved Universities profit from their cooperation by giving them insight in the resulting data. To limit the burden on their panel members, EPECS strives to keeping the questionnaires limited to ten or 15 minutes and wants to use mainly closed questions. Questionnaires that EPECS has used thus far (in ePanels other than their own) have been pretested on a very limited level. EPECS volunteers asked a convenience sample of people (e.g. relatives) whether they understood the questions. EPECS wants to present their ePanel with a maximum of three to four surveys per year.

EPECS guarantees anonymous processing of the data. Only one person could theoretically trace back responses to the individual. This person has technical responsibility over the ePanel and has nothing to gain by results of the ePanel. EPECS does not, nor will it ever, use information about participants in the panel for commercial goals and has communicated so to their members.

Data analysis. Analysis of the data is done automatically and results are presented in pdf format. Rough data can be summoned in excel format, so that further analysis would be possible when needed. This would then be done by EPECS itself. EPECS is also responsible for formulating a brief summary of the survey results, so feedback can be given to participants. Feedback will always be given within four weeks after the survey was closed. This will be done after each survey. EPECS does not plan to monitor characteristics of who does or does not complete the surveys. This would however theoretically be possible.

5. Conclusion

Based on this study it can be concluded that it is rather difficult for stakeholder groups to reach consensus on what knowledge is important for the general public. This holds for knowledge on MRSA and knowledge on antibiotics use. Items that the entire group of Delphi respondents reached consensus on concerned items on what patients can do themselves (seven out of 15 consensus items), risks of antibiotics use (three items), consequences of MRSA-colonization for contacts (two items), treatment in isolation in case of MRSA-colonizatoin (one item), the risk of hospitalization abroad (one item) and the difference between MRSA-colonization and -infection (one item).

However, within each stakeholder group the degree of consensus was higher, which may imply that differences are due to profession or personal experiences of the stakeholder groups. Patients and clinical microbiologists reached within group consensus most often. Health service organization employees overall reach the least consensus within their own group and with the other groups.

Gaps between knowledge that the general public should have according to the Delphi respondents and existing national MRSA- and ASP-guidelines are found. Mainly topics that include patient participation and socio-emotional consequences of MRSA-colonization or –infection are not covered in the guidelines. This may be due to the different purposes of the two: The Delphi is strictly aimed at what the general public should know in everyday life and as patients, whereas the guidelines are written for clinical application by professionals. It is therefore not always a problem when the Delphi items do not match the guidelines. This is also shown by comparing the Delphi with the website MRSA-net, which might be a more appropriate match with the goals of the Delphi. However, it is crucial that the information is available and easy to find.

Although we live in a digital age, the Delphi participants have only reached consensus on the importance of offline information sources, in the form of different healthcare workers. These healthcare workers are assumed to gain their information from the national guidelines. However, as stated before, the guidelines do not cover much of the more practical information that is relevant to the general public. It must be considered whether this information should be added to the guidelines. The fact that relatively few information sources were considered important suggests that the current information sources are insufficient in providing awareness, knowledge and skills needed for patient participation in infection prevention and –control in cross-border healthcare settings. Therefore the knowledge items found in this study (supplemented to develop a complete item bank) should be measured via an ePanel so that tailored information can be offered.

The literature study has shown there are different possibilities for founding and working with an ePanel. Application of these findings to the EPECS ePanel has suggested that the EPECS ePanel in its current form would suffer from generalizability issues. This is due to its rather one-sided member base (which mainly exists of older Dutch people). It must be noted that the EPECS ePanel is still in its founding stage, which means it might not be fair to expect perfection just yet and there are still plenty of opportunities for improvement.

6. Discussion

6.1 Methodology

This study used a Delphi method to involve different stakeholder groups in developing an item list which could be used to adequately measure the general public's knowledge on MRSA and antibiotic use. In doing so, it would have been interesting to be able to perform an ANOVA analysis to measure within and between group differences in judgment of the items. However, due to the qualitative set-up and accompanying low number of participants (n=19), statistical tests could not be applied and all analysis were based on frequencies only.

Another consequence of the low number of participants, especially in the group of clinical-microbiologists (n=3-4), is that consensus might have been higher than it would be in a larger population. However, this study has anticipated on this risk by setting a relatively high standard for consensus, demanding 95,5% of respondents agree for n=22 and an even higher percentage in following rounds (were the n was slightly lower). Also, possible negative effects of the low n where limited by using a more qualitative process in the study. Open ended questions where included in the Delphi study to achieve more depth in the data.

Furthermore, fewer consensuses than expected were reached. This might be because there was too little interaction between Delphi respondents to really influence each other's opinions. For future research via a Delphi, it might be advisable to include a focus group meeting in the process. Another possible explanation that is also subscribed by literature is the fact that this Delphi group existed of a very heterogeneous group of people (Linstone & Turoff, 1975). This does however provide the current study with a broad base.

The fact that participants did change their opinions over the different rounds (both toward consensus and toward non-consensus) implies that the Delphi procedure did influence their opinions. This may have happened based on the arguments that their fellow respondents reported. However, the individual respondents were unaware of who's arguments it were and which stakeholder group they represented. In this way it was attemted to stimulate respondents to think about the items themselves. The changes in opinions may also be caused by the mere participation in a Delphi procedure. The procedure may function as a tool to increase awareness of certain issues.

Some participants in the Delphi study did drop out during the study. These people were relatively evenly distributed across the different stakeholder groups (in round two: One clinical-microbiologist, one infection control practitioner and one patient). Reasons for dropout are unknown.

6.2 Selecting Items to Measure Knowledge

The current study has aimed at determining gaps in the knowledge and needs of the general public concerning MRSA and ASP. This was done by asking experts in the field, via a Delphi study, which items (concerning both knowledge and skills) are important to enable patient participation. This list of items should be supplemented with other items and therefore be considered a first step in the development of a complete set of items to measure knowledge. A relevant measure to check to which extent a specific set of items reflects the content domain is content validity. The content validity is maximized by working with an item bank. This can be used to measure knowledge and is defined as: "A large collection of good test items for which their quality is analyzed and known, and which are systematically stored in a computer so that they are accessible… for measuring achievement or ability" (Chuesathuchon & Waugh, 2008). By working with an item bank to determine knowledge or the lack thereof, the risk of learning effects through repeated measurement is reduced (since different items can be used to measure the same constructs each time). This also increases the internal validity.

When participants did not agree that an item was an important aspect of the general public's knowledge, their argumentation was often that the knowledge was too specific for all people to know. The information was then regarded as more appropriate for education to MRSA-patients only. It might be advisable to perform a separate measurement of which knowledge the entire general public should have and for which items it would be sufficient if MRSA-patients are aware of them. This could then result in an item bank for the general public and additionally an extra item bank with items that only MRSA-patients need to know about.

However, the development of a tool to measure needed knowledge is only a first step. This study has shown that existing information sources, which are after all necessary to enlarge the general public's

knowledge, are insufficient. Websites that do exist to inform the general public are only found if individuals actively seek them. This only works when the public has some level of awareness of the issue and that is the exact problem with infection prevention: action should be taken *before* awareness of the problems becomes necessary via colonization or infection with a healthcare associated infection. Therefore it seems advisable to actively recruit people for participation in an ePanel, to measure current knowledge via that ePanel and to immediately offer tailored information to improve the level of knowledge. This way it is avoided that education is completely dependent on the patients' initiative. It also enables differentiation between information for the general public and patients.

6.3 Organization of the ePanel

Within this study a literature study was performed to evaluate the scientific value of ePanels. Strikingly little research has yet been performed to study this subject. Thus far, all literature that was found on performing research via ePanels has used online surveys. Therefore it was decided to use additional literature on online surveys to complement the literature on ePanels. It should however be remembered that threats to the validity of online survey may differ somewhat from the threats for ePanels. Therefore, although some relevant conclusions can be drawn from the literature study, additional research will be necessary. It is crucial for the scientific value of the results of the ePanel that panel members are an accurate representation of the general public. This means demographic characteristics (such as SES) should roughly be equally distributed. This should therefore be monitored at all times.

The most effective way to recruit people to participate is to use e-mail invitations. A literature study has however suggested that this method does cause a risk of selection bias. People who do not have access to the internet or don't use e-mail are excluded from participation. To avoid this bias, non-internet users should be more actively recruited (they may for example be elderly). They may be recruited via nursing homes or via other care institutions that they already have contact with. It has additionally proven important to appeal to the general public's interest in gaining new information to motivate them to participate. To do so, it might be advisable to offer them some informational websites after completing a survey on a certain topic. This way, after measuring (gaps in) knowledge on MRSA and antibiotic use, participants can immediately improve their knowledge on the subject. However, this does pose the risk of learning effects.

To decide whether or not to offer incentives for participation several pros and cons should be considered. On the one hand offering a material incentive could, according to existing literature, convince more people to participate. On the other hand, the chosen type of incentive might attract a certain population. Another risk is to attract 'incentive-hunters' who rush through surveys to attain the reward. Overall it might be best to offer intrinsic incentives. This way intrinsically motivated people are not driven away and incentive-hunters are avoided. Many people participate in an ePanel for the value-expressive functional source. This implies that it should be made clear to potential participants that being a panel member would be an opportunity for the individual to express their self-concepts and values. Otherwise, when offering a materialistic incentive, measures could be taken to monitor the seriousness of participants, e.g. IP-addresses could be checked to avoid double admissions, time spend filling in a survey can be checked to avoid people rushing through the survey and in organizing online discussions it can be monitored who does not actively participate.

6.4 Future Research

Future research should first of all focus on supplementing the current item set to develop an item bank, which can be used to determine (gaps in) knowledge on MRSA and ASP for both the general public and MRSA-patients. To do so, further discussion is needed to determine what knowledge is necessary. Secondly, additional research is necessary to study the scientific value of ePanels in general. The application of research methods other than online surveys should also be included in this study. Finally more research is needed to develop an information tool to measure and increase knowledge. The current study can be seen as a contextual inquiry as described in the CeHRes (Center for eHealth Research) roadmap, which is applied within the EurSafety Health-net project (Gemert-Pijnen et al., 2011).

7. Recommendations

7.1 Recruiting ePanel Members

In recruitment of ePanel members it must be attempted to make sure the ePanel members are a good representation of the general public. Characteristics that should be given attention are both demographic and psychological, for the public's knowledge on e.g. MRSA and antibiotic use may not only depend on their SES (such as level of education) but also on personal experiences that may have triggered an above average interest in the subject. Both could be threats to the generalizability of the ePanel results.

The most efficient way to accumulate ePanel members seems to be sending invitations through e-mail. Within this e-mail goals and importance of the individual's participation in the ePanel must be made clear. Furthermore, it should be empathized that participation would be a means to gain information and to express their opinion on multiple subjects. Both the invitation and the further interactions with participants should be aimed at creating a sense of community, to ensure longer duration of membership. It seems to be advisable to offer incentives for participation in order to attract as many members as possible. These should be intrinsic incentives, since most people who do participate in an ePanel are motivated by intrinsic motivations and incentives should match these.

7.2 Constructing a Questionnaire

There are several measures that should be taken in developing any questionnaire for the ePanel, to ensure maximum reliability, validity and generalizability. To monitor the internal consistency reliability multiple questions should be included to measure knowledge on the same item. These questions can be either similar or contradictive. Cronbach's Alpha coefficient can then be calculated as a measure of internal consistency reliability (DeVellis, 1991). To reach the maximum generalizability of the results, all relevant (demographic and psychological) characteristics of participants should be known. By conducting an ANOVA analysis it can be measured whether findings can be generalized across individuals with different characteristics (DeVellis, 1991).

In developing a questionnaire on MRSA and prudent antibiotic use, three dimensions should be included in it: The general public's knowledge of, attitudes towards and practices concerning MRSA and antibiotic use. Thus, a complete overview of the general public's perceptions of the topics is accumulated.

7.3 Optimizing Data Collection

To prevent learning effects from occurring, only the most relevant questions should be asked and the length of time it takes to fill out any questionnaire should be limited to about 15 minutes (Babbie, 2004; Batinic, et al., 2000). Furthermore, it should be avoided to solely focus on a single topic in multiple surveys, since that would increase the members' awareness concerning that topic (Panagakou, et al., 2009). Finally, to minimize security bias, much attention should be paid to reassuring (potential) participants that any personal data they submit in the surveys or upon admission will be treated with the utmost confidentiality.

7.4 Optimizing Data Analysis

First and foremost it is important to closely monitor the characteristics of the panel members and the general population they are sampled from. Not only to assess the generalizability of the ePanel due to selection or dropout, but also due to learning effects. When funds and planning allow it, it would be best to conduct a small-sample parallel study with fresh cross-sections of the population (Dennis, 2001).

7.5 Developing an Information Tool

7.5.1 Background

This study has shown that gaps exist between what different stakeholder groups think the general public should know and de information that is given in national guidelines. These gaps imply that the general public needs certain information, but this information is not to be found in the currently available and known information sources. Therefore, to overcome these gaps, some kind of information or education tool is needed. Based on prior research an attempt to develop such information tool has been made in the form of the website www.mrsa-net.nl. The current study has shown that this website is largely sufficient in the provision of the

needed information (except for information about antibiotic use). However, another conclusion that is drawn based on the current study is that an education attempt should not be fully dependent on the general public's initiative. One of the reasons for this conclusion is that the key to success for infection prevention is to reach the public before they are confronted with hospital associated infections themselves. This is because preventive measures should per definition be applied when an individual is not infected yet. The choice to develop an online tool is made since via the internet a very large population can be reached. For example, over 95% of Dutch people have access to the internet, so they would all be able to participate. Also, the internet enables constant tailoring of the information to the current degree of knowledge among members of the general public. Finally, when new insights arise about what knowledge is important, the item bank via which the knowledge is measured can easily be updated. The above described problems and opportunities have led to the recommendation to develop an online information tool which is applied via ePanels.

7.5.2 Goals of the information tool

To enable effective patient participation, it is first of all important that the target population (in this case: the general public) is aware of the issue. Awareness alone however, is not sufficient. Prior research has shown that knowledge on MRSA, antibiotic use and infection prevention and –control among the general public is limited (see §3.1 and §3.2). Therefore, it is also necessary to increase this knowledge to enable effective patient participation in infection prevention and –control in a crossborder healthcare setting. To be able to educate the general public, it must be known what they do and do not know yet. This is also relevant since endless amounts of information are available, which makes it crucial to tailor provided information.

In short, the information application aims at fulfilling multiple purposes at the same time: increasing awareness of the issue of infection prevention and –control among the general public, measuring current degree of knowledge on MRSA and antibiotic use and improving that knowledge.

7.5.3 Development of the information tool

First step in the development of the information tool is to further discuss the non-consensus items. The current Delphi study can be used as a basis. Preferably, a group of experts should meet in a focus group setting. They can then discuss the importance of certain knowledge, based on gaps in consensus about importance between different stakeholder groups and based on gaps between the Delphi results and existing national guidelines. Aim of the focus group meeting(s) should be providing more clarity on what is important knowledge for the general public.

Second, based on the results of the Delphi study and focus group an item bank must be developed. For each topic that is considered important knowledge for the general public, and therefore should be measured to determine current degree of knowledge, multiple items should be developed. This can help in preventing learning effects.

Third step is to develop the information tool itself. The intended users (members of the general public) should be involved in this process. This will help to ensure the tool fits the users' needs and abilities. A method that could be used to involve the intended users is the Mental Models Approach, as it was used in the development of the website www.mrsa-net.nl (Verhoeven, Karreman, Bosma, Hendrix, & Gemert-Pijnen, 2010). Of course it is critically important that the information that is presented in the information tool is correct and understandable. In most cases, information from www.mrsa-net.nl can be used in the tool, since the website is based on national guidelines and checked for understanding among the general public. If the needed information is not available on the website, it should be based on the national guidelines and formulated in cooperation with both experts and patients to ensure accuracy and understanding.

Finally, members of the general public who are willing to use the information tool must be found. This is briefly described below (§7.5.4).

7.5.4 Target population

Aim of the information tool is to measure and improve the general public's knowledge about MRSA and antibiotic use to enable patient participation in infection prevention and –control in cross-border healthcare

settings. The target population of the tool therefore consists of the general public of the Netherlands, Germany and Belgium. As stated before, members of the general public are often unaware of the issue of infection prevention and –control in crossborder healthcare settings. There might therefore not be many people who are interested in using the information tool if they have to do so on their own initiative. Still, to be able to reliably measure the current degree of knowledge on the topic among the general public, a large group of people is needed. This is also the case in striving to increase their knowledge. To achieve inclusion of relatively many people, it might be advisable to use existing ePanels, such as the one of EPECS. These ePanels have already gathered a group of people. By including them it is avoided to only reach people who have a special interest in the topics MRSA and antibiotic use, to participate in the information tool. In addition to the size of the group of people who use the information tool, the current study has also indicated it is important that the participating population is representative of the target population. This must constantly be monitored. Groups of people in the general public that may be under represented in the ePanels should actively be recruited (as also discussed in §4.2.1, §6.3 and §7.1).

Besides introducing the information application via an ePanel, it can also be included as an app on websites such as the infection manager dashboard (www.infectionmanager.com) and www.mrsa-net.nl, so that people who do actively seek for information on the topics can also benefit from the tool. In this case, information on the demographic characteristics of the individual should explicitly be asked.

7.5.5 Description of the information tool

Throughout the entire information tool, logos of the institutions that support the tool, such as the University of Twente and the EurSafety Health-net project must be visible. It should constantly be clear who have been involved in the development of the tool, since this underlines its reliability.

The current study has shown that thus far, ePanels are only known to use online questionnaires. Therefore, until more research has been performed on alternative research methods, the information tool will also use an online questionnaire. In the tool, participants are first presented with a welcome screen. Here, the importance of the questionnaire is explained, it is emphasized that the individual respondent's opinion is very relevant for the study and that the individual will gain (new) information through participation. This is done to maximize the participation rate by offering intrinsic rewards (see also §4.2.1, §6.3 and §7.1).

It is assumed that demographic information about the participants is known due to their participation in an ePanel. If this is not the case, demographic information should be asked. Then, the respondents are asked whether they have prior experience with MRSA (either via their profession or via person experience). This will help in explaining possible differences in degree of knowledge. Moreover, it enables differentiation of the questions and provided information between the general public as a whole and patients in specific (§6.2).

After getting started with the actual questionnaire, the respondents are presented with questions based on the developed item bank, to measure knowledge on MRSA or antibiotic use. All questions should have multiple choice answers to enable relatively quick analyzis of the results. After answering a question, the respondent is presented with an information screen. This screen is always shown, no matter whether the question was answered correctly. On the information screen it is stated whether or not the given answer was correct and it is explained why this is so. In case of an incorrect answer, gaps in the individual's knowledge can immediately be addressed. By also giving the information after a correct answer, it is avoided that an individual misses key information after a correct guess. Completing the entire questionnaire should not take any longer than 15 minutes to avoid high rates of drop-out and to limit the threat of learning effects (see §3.6.3, §4.2.1 and §7.3).

On the final page of the information tool it should be emphasized that the repondent's participation is appreciated. The percentage of correct answers of the individual should be given and be compared to the average percentage of all participants. Also, it should be explained why it is important for the individual to have some knowledge on MRSA and antibiotic use. A link to the internet address where the information tool can be found must be given, so respondents can easily send this link to their contacts, with a standardised invitation to participate (which can be personalized if preferred). This is all meant to stimulate the respondent to search for additional information and to talk about the questionnaire with the people around them, so they may also participate.

7.5.6 Results of the information tool

As the goals of the information tool are threefold, so are its results. First of all, the mere participation of members of the general public in the tool may increase their awareness of the discussed topics. Awareness can only be created by actively recruiting people to learn about the topic, which is done here via ePanels. Being aware of the issues with MRSA and antibiotic use is a prerequisite for improving knowledge (see also §6.2).

Second, the information tool is a method to structurally measure the current degree of knowledge on the topics of MRSA and antibiotic use among the general public. Current degree of knowledge must be known to be able to develop effective education (see also §3.4).

Finally, the information tool is a form of education in itself. By connecting the answers an individual respondent gives to the information, tailored education is provided. This way, individuals are (inter)actively involved in their own learning process and it is prevented that an information overload arises. This will better enable members of the general public to participate in effective infection prevention and –control in cross-border healthcare settings and not only benefit the members of the general public (who improve their knowledge), but also healthcare organizations and the healthcare providers who work for them.

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Appendices

Appendix A: Comparison of traditional and Delphi study

Table 17: Comparison of Traditional Survey and Delphi Study (Maduro, 2004)

Traditional survey	Delphi study
Summary of procedure	
Researchers design a questionnaire with questions relevant to the issue of study. The questionnaire can aim at soliciting quantitative data, qualitative data, or both. The researchers decide on the population that the hypotheses apply to, and selects a random sample of this population on whom to administer the survey. The respondents fill out the survey and return it. The researchers then analyze the usable responses to investigate the research questions.	After the researchers design the questionnaire, they select an appropriate group of experts who are qualified to answer the questions. The researchers then administer the survey and analyze the responses. Next, they design another survey based on the responses to the first one and re-administers it, asking respondents to revise their original responses and/or answer other questions based on group feedback from the first survey. The researchers reiterate this process until the respondents reach a satisfactory degree of consensus. The respondents are kept anonymous to each other (though not to the researcher) throughout the process.
Representativeness of sample	
Using statistical sampling techniques, the researchers randomly select a sample that is representative of the population of interest.	The questions that a Delphi study investigates are those of high uncertainty and speculation. Thus, a general population, or even a narrow subset of a general population, might not be sufficiently knowledgeable to answer the questions accurately. A Delphi study is a virtual panel of experts gathered to arrive at an answer to a difficult question. Thus, a Delphi study could be considered a type of virtual meeting or as a group decision technique, though it appears to be a complicated survey.
Sample size for statistical power and significant findings	
Because the goal is to generalize results to a larger population, the researchers need to select a sample size that is large enough to detect statistically significant effects in the population. Power analysis is required to determine an appropriate sample size.	The Delphi group size does not depend on statistical power, but rather on group dynamics for arriving at consensus among experts. Thus, the literature recommends 10–18 experts on a Delphi panel.
Individual vs. group response	
The researchers average out individuals' responses to determine the average response for the sample, which they generalize to the relevant population.	Studies have consistently shown that for questions requiring expert judgment, the average of individual responses is inferior to the averages produced by group decision processes; research has explicitly shown that the Delphi method bears this out.
Reliability and response revision	
An important criterion for evaluating surveys is the reliability of the measures. Researchers typically assure this by pretesting and by retesting to assure test-retest reliability.	Pretesting is also an important reliability assurance for the Delphi method. However, test-retest reliability is not relevant, since researchers expect respondents to revise their responses.
Construct validity	

Construct validity is assured by careful survey design and by pretesting.	In addition to what is required of a survey, the Delphi method can employ further construct validation by asking experts to validate the researcher's interpretation and categorization of the variables. The fact that Delphi is not anonymous (to the researcher) permits this validation step, unlike many surveys.
Anonymity	
Respondents are almost always anonymous to each other, and often anonymous to the researcher.	Respondents are always anonymous to each other, but never anonymous to the researcher. This gives the researchers more opportunity to follow up for clarifications and further qualitative data.
Non-response issues	
Researchers need to investigate the possibility of non-response bias to ensure that the sample remains representative of the population.	Non-response is typically very low in Delphi surveys, since most researchers have personally obtained assurances of participation.
Attrition effects	
For single surveys, attrition (participant drop-out) is a non-issue. For multi-step repeated survey studies, researchers should investigate attrition to assure that it is random and non-systematic.	Similar to non-response, attrition tends to be low in Delphi studies, and the researchers usually can easily ascertain the cause by talking with the dropouts.
Richness of data	
The richness of data depends on the form and depth of the questions, and on the possibility of follow-up, such as interviews. Follow-up is often limited when the researchers are unable to track respondents.	In addition to the richness issues of traditional surveys, Delphi studies inherently provide richer data because of their multiple iterations and their response revision due to feedback. Moreover, Delphi participants tend to be open to follow-up interviews.

Appendix B: MRSA literature input for Delphi study

Items	References
Wat is MRSA	
- MRSA is een ziekenhuisbacterie	- (Bosma, 2007; EPECS, 2011; Gill, et al., 2006; Hamour, et al., 2003; McLaughlin, et al., 2008)
Besmetting	
- Iemand kan met MRSA besmet zijn zonder er ziek van te worden	- (Bosma, 2007; McLaughlin, et al., 2008)
Preventie	
- Als een patiënt recent opgenomen is geweest in een buitenlands ziekenhuis, kan dit een reden zijn hem in een Nederlands ziekenhuis geïsoleerd te verplegen.	- (Bosma, 2007; Coia, et al., 2006; EPECS, 2011)
- Patiënten die recent in een buitenlands ziekenhuis opgenomen zijn geweest moeten dit bij opname in een Nederlands ziekenhuis direct melden, zodat zij getest kunnen worden op MRSA-besmetting.	- (Gezondheidsraad, 2006)
- Patiënten die werkzaam zijn op een veehouderij moeten dit bij opname in een Nederlands ziekenhuis direct melden, zodat zij gescreened kunnen worden op MRSA-besmetting.	- (Gezondheidsraad, 2006)
- Patiënten die eerder besmet of geïnfecteerd zijn geweest met de MRSA-bacterie moeten dit bij opname in een Nederlands ziekenhuis direct melden, zodat zij gescreend kunnen worden op MRSA-besmetting.	- (Gezondheidsraad, 2006)
- De verspreiding van MRSA kan worden tegengegaan door het strikt toepassen van desinfectiemaatregelen en handhygiëne.	- (Bosma, 2007; Coia, et al., 2006; Finch, et al., 2004; Gill, et al., 2006; Hamour, et al., 2003; Joffe, et al., 2011; McGuckin, et al., 2006; McLaughlin, et al., 2008)
- De verspreiding van MRSA kan worden tegengegaan door het gebruik van persoonlijke beschermingsmiddelen (schort, mondneusmasker, etc.)	- (Coia, et al., 2006; Hamour, et al., 2003; Joffe, et al., 2011)
- De verspreiding van MRSA kan worden tegengegaan door te zorgen voor een hygiënische zorg- en leefomgeving.	- (Coia, et al., 2006; Gill, et al., 2006; Joffe, et al., 2011; Loveday, et al., 2006; McGuckin, et al., 2006; Washer, et al., 2008)
- De verspreiding van MRSA kan worden tegengegaan door correct om te gaan met besmet (klinisch) afval en linnengoed.	- (Coia, et al., 2006)
- Patiënten die besmet zijn met MRSA moeten in het ziekenhuis geïsoleerd verpleegd worden.	- (Bosma, 2007; Coia, et al., 2006)
Reservoir	
- MRSA kan in het bloed, de slijmvliezen (zoals neus en keel), het haar en op de huid voorkomen.	- (Bosma, 2007; Coia, et al., 2006; Joffe, et al., 2011)
Verspreiding	
- MRSA kan voorkomen op bijvoorbeeld vloeren, toiletten of medische apparatuur, en zich via aanraking verder verspreiden.	- (Bosma, 2007; Joffe, et al., 2011)
- MRSA kan zich verspreiden door huid-op-huid contact.	- (Bosma, 2007; EPECS, 2011; Joffe, et al., 2011)
- MRSA kan van dier op mens worden overgebracht.	- (Bosma, 2007; Graveland, et al., 2011; Leonard & Markey, 2008)
- MRSA kan in Nederland worden verspreid door mensen die in het buitenland zijn geweest.	- (Bosma, 2007; Joffe, et al., 2011)

Gevolgen	
- Een MRSA-besmetting kan een infectie veroorzaken.	- (Bosma, 2007; Coia, et al., 2006; Hamour, et al., 2003)
- Een MRSA-infectie kan lijden tot overlijden van de patiënt.	- (Coia, et al., 2006)
- Een patiënt die besmet is met MRSA blijft gemiddeld langer in het ziekenhuis dan een patiënt zonder MRSA-besmetting.	- (Bosma, 2007; Hamour, et al., 2003)
Risicofactoren	
- Onhygiënische omstandigheden verhogen de kans op het besmet raken met MRSA.	- (Bosma, 2007; Joffe, et al., 2011)
- Wonden of andere huidafwijkingen verhogen de kans op een MRSA-infectie.	- (Bosma, 2007; Coia, et al., 2006)
- Een recente buitenlandse ziekenhuisopname verhoogt de kans op het besmet raken met MRSA.	- (Bosma, 2007; Coia, et al., 2006)
- Huid-op-huid-contact verhoogt de kans op het besmet raken met MRSA.	- (Bosma, 2007; Coia, et al., 2006)
- Huidproblemen zoals eczeem verhogen de kans op een MRSA-infectie.	- (Bosma, 2007; Coia, et al., 2006)
Herkomst	
- MRSA komt voor in ziekenhuizen.	- (Bosma, 2007; EPECS, 2011; Hamour, et al., 2003; McLaughlin, et al., 2008)
- MRSA komt voor in verpleeghuizen.	- (Baldwin et al., 2010; Bosma, 2007)
- MRSA komt voor buiten zorginstellingen, in de 'gewone' samenleving.	- (Bosma, 2007; EPECS, 2011; Hamour, et al., 2003; McLaughlin, et al., 2008)
- MRSA komt voor bij vee, zoals varkens en kalveren.	- (Bosma, 2007; Graveland, et al., 2011; Leonard & Markey, 2008)
Behandeling	
- Tijdige behandeling van een MRSA-besmetting verlaagt het aantal MRSA infecties en het sterftecijfer ten gevolge van MRSA.	- (Bosma, 2007; Coia, et al., 2006)
- Een MRSA-infectie kan alleen bestreden worden met specifieke antibiotica.	- (Bosma, 2007; McLaughlin, et al., 2008)
- De meeste antibiotica zijn niet effectief tegen een MRSA infectie.	- (Bosma, 2007; EPECS, 2011)

10-punten-plan. Wat u als burger moet weten over MRSA

By EPECS and EurSafety Healthnet (2011)

1. MRSA wordt vaak ook wel een 'ziekenhuisbacterie' genoemd, omdat hij vooral heel gevaarlijk is voor ziekenhuispatiënten die weinig weerstand hebben.

2. MRSA is een bacterie die ongevoelig (resistent) is voor de meeste soorten antibiotica. De ziekteverschijnselen zijn heel moeilijk te behandelen.

3. Als u in een buitenlands ziekenhuis bent behandeld en daarna in een Nederlands ziekenhuis behandeling nodig heeft, zal u een bij binnenkomst een speciale behandeling krijgen. Zo wordt u oa afgezonderd van andere patiënten en moet u een mondkapje dragen. Dit wordt gedaan om andere patiënten te beschermen.

4. MRSA kan in een ziekenhuis worden opgelopen, maar ook daarbuiten. De bacterie wordt meestal overgedragen door direct huidcontact met iemand die al besmet is. Een besmetting met MRSA kan alleen aangetoond worden door kweekonderzoek in een laboratorium. Gezonde mensen ondervinden meestal geen hinder van een besmetting met MRSA.

5. Als bij u een MRSA-besmetting is vastgesteld, u bent dan MRSA-drager, dan kan overdracht van de besmetting op anderen worden bestreden met desinfecterende zeep, shampoo, neuszalf en/ of huidzalf. Alleen als de MRSA-besmetting tot een MRSA-infectie heeft geleid, zult u worden behandeld met een antibioticum waar de MRSA-bacterie nog wel gevoelig voor is.

6. Bij een ziekenhuisbehandeling of -opname is het voor u zelf van belang om te weten of u met MRSA besmet bent. MRSA kan namelijk uw genezing in de weg staan. Artsen of verpleegkundigen kunnen u vertellen of u in de risicogroep valt van mensen die MRSA zouden kunnen hebben. Kijkt u voor de risicogroepen op www.mrsa-net.nl of www.euprevent.eu .

7. Als u zelf gezond bent verdwijnt de MRSA bacterie weer na verloop van tijd uit uw lichaam. MRSA kan echter wel gevaarlijk zijn als uw weerstand verzwakt is, omdat de bacterie dan infecties als bot-, wond-, of longontsteking kan veroorzaken.

8. Wat u zelf kunt doen om de kans op een besmetting met MRSA te verkleinen: Gezondheidsmedewerker te vragen of zij hun handen gedesinfecteerd hebben voordat ze u de hand schudden; van tevoren welke maatregelen daar zijn genomen om MRSA –besmetting te voorkomen. Sommige ziekenhuizen in Duitsland zijn al aangesloten bij het kwaliteitskeurmerk 'eursafety healthnet kwaliteitszegel'. Dit garandeert dat er extra aandacht is besteed aan dit thema.

9. U kunt op verschillende manieren informatie krijgen over MRSA en andere bacteriën. U kunt informatie vinden op de websites www.mrsa-net.nl of www.euprevent.eu, of informatie vragen aan uw gezondheidswerker. U kunt ook contact opnemen met een patiëntenorganisatie, zoals de Zorgbelang-organisatie in uw provincie, die kunt u vinden op www.zorgbelang-nederland.nl.

10. Door overmatig en onnodig voorschrijven van antibiotica neemt het aantal resistente bacteriën sterk toe. Voor de toekomst van onszelf, onze kinderen en onze kleinkinderen is het van groot belang dat er beter en vooral zorgvuldiger wordt omgegaan met antibiotica.

Appendix C: Antibiotics literature input for Delphi study.

Items	References
Antibiotica	
- Het is belangrijk dat een antibioticakuur helemaal afgemaakt wordt.	- (Chan, et al., 2011; McNulty, et al., 2007)
- Het is belangrijk dat zo min mogelijk gebruik wordt gemaakt van breed-spectrum antibiotica (met name derde generatie cephalosporins en floroquinolones).	- (Coia, et al., 2006)
- Het is belangrijk dat voorkomen wordt dat een voorgeschreven antibioticakuur te lang of te kort is.	- (Coia, et al., 2006)
- Antibiotica werken niet tegen virussen.	- (Belongia, et al., 2002; Finch, et al., 2004; Karreman, et al.; McNulty, et al., 2007)
- Antibiotica werken niet tegen verkoudheid of hoesten.	- (Belongia, et al., 2002; Karreman, et al.; McNulty, et al., 2007)
- Antibiotica kunnen bacteriën doden.	- (Belongia, et al., 2002; Karreman, et al.; McNulty, et al., 2007)
- In de veeteelt worden antibiotica ook preventief voorgeschreven, waardoor het risico op resistente bacteriën toeneemt.	- (Barton, 2000; Feinman, 1998)
- Op de huid en in de buik leven normaal gesproken bacteriën die goed zijn voor de gezondheid.	- (Karreman, et al.; McNulty, et al., 2007)
- Antibiotica kunnen de 'goede' bacteriën die op de huid en in de buik leven ook doden.	- (Karreman, et al.; McNulty, et al., 2007)
Resistentie	
- Als te veel antibiotica worden gebruikt, is het minder waarschijnlijk dat ze ook in de toekomst goed werken..	- (Karreman, et al.; McNulty, et al., 2007)
- Door overmatig gebruik van antibiotica ontstaan steeds meer resistente bacteriën.	- (Coia, et al., 2006; EPECS, 2011; Finch, et al., 2004; Goossens et al., 2006; McLaughlin, et al., 2008; McNulty, et al., 2007; Washer, et al., 2008)
- Een infectie die veroorzaakt is door een resistente bacterie is moeilijk te behandelen.	- (Acar, 1997; Karreman, et al.)
- Bacteriën kunnen resistent worden tegen antibiotica.	- (Coia, et al., 2006; Finch, et al., 2004; Goossens, et al., 2006; McLaughlin, et al., 2008; McNulty, et al., 2007; Washer, et al., 2008)
- Iedereen kan besmet raken met een bacterie die resistent is tegen een of meerdere soorten antibiotica.	- (McNulty, et al., 2007; Washer, et al., 2008)

Appendix D: Overview of consensus on items after each round.

Table 18: Overview of Consensus on MRSA Knowledge Items After Each Delphi Round

Items	RONDE 1					RONDE 2					RONDE 3				
	Overall (22)	Arts-microbioloog (4)	Ziekenhuis hygiënist (6)	GGD (6)	(omgeving) patiënt (6)	**Overall (19)**	Arts-microbioloog (3)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)	**Overall (20)**	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
Wat is MRSA															
- MRSA is een ziekenhuisbacterie	O	I	O	I	O	O	I	O	O	O	O	VI	I	O	VI
- Het enige verschil tussen MRSA en MSSA is dat MRSA resistent is tegen Methicilline (een antibioticum).	–	–	–	–	–	O	O	O	O	VI	O	O	O	O	VI
- Er bestaan drie verschillende soorten MRSA: Hospital (ziekenhuis) MRSA, Livestock (vee) MRSA en Community ('gewone' samenleving) MRSA.	–	–	–	–	–	O	VI	O	O	VI	O	VI	O	O	I
- Problemen bij hospital MRSA zijn anders dan problemen bij community MRSA.	–	–	–	–	–	O	I	N	O	VI	O	O	O	O	VI
- Community MRSA hoeft niet altijd problemen te veroorzaken maar kan wel gevaarlijk zijn voor gezonde mensen.	–	–	–	–	–	O	I*	N	O	VI	O	I	N	O	I
Besmetting															
- *Iemand kan met MRSA besmet zijn zonder er ziek van te worden.*	VI	VI*	I	VI	VI*	~	~	~	~	~	~	~	~	~	~
Preventie															
- *Als een patiënt recent opgenomen is geweest in een buitenlands ziekenhuis, kan dit een reden zijn hem in een Nederlands ziekenhuis geïsoleerd te verplegen.*	VI	VI	VI	I	VI*	~	~	~	~	~	~	~	~	~	~
- *Patiënten die recent in een buitenlands ziekenhuis opgenomen zijn geweest moeten dit bij opname in een Nederlands ziekenhuis direct melden, zodat zij getest kunnen worden op MRSA-besmetting.*	VI	VI	VI	I-VI	VI*	~	~	~	~	~	~	~	~	~	~
- *Patiënten die werkzaam zijn op een veehouderij moeten dit bij opname in een Nederlands ziekenhuis direct melden, zodat zij gescreened kunnen worden op MRSA-besmetting.*	O	VI	VI	O	VI*	VI	I	VI	VI	I	~	~	~	~	~

*VU → Very Unimportant, U → Unimportant, N → Neutral, I → Important, VI → Very Important,– → Not yet included in Delphi, O → No consensus reached, * → Unanimously rated, Italicized → Included in final item list, ~ → Removed from Delphi after concensus is reached.*

Table 18 cont.: Overview of Consensus on MRSA Knowledge Items After Each Delphi Round

Items	RONDE 1					RONDE 2					RONDE 3				
	Overall (22)	Arts-microbioloog (4)	Ziekenhuis hygiënist (6)	GGD (6)	(omgeving) patiënt (6)	**Overall (19)**	Arts-microbioloog (3)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)	**Overall (20)**	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
Preventie															
- Patiënten die eerder besmet of geïnfecteerd zijn geweest met de MRSA-bacterie moeten dit bij opname in een Nederlands ziekenhuis direct melden, zodat zij gescreend kunnen worden op MRSA-besmetting.	O	VI*	VI	O	VI	O	VI	O	I	I	O	VI*	VI	O	I
- De verspreiding van MRSA kan worden tegengegaan door het strikt toepassen van desinfectiemaatregelen en handhygiëne.	O	O	VI	O	VI	O	VI	VI	I	I	O	VI	VI	I	VI
- De verspreiding van MRSA kan worden tegengegaan door het gebruik van persoonlijke beschermingsmiddelen (schort, mondneusmasker, etc.).	O	VI	I	O	VI	O	I	O	O	O	O	I	I	O	I
- De verspreiding van MRSA kan worden tegengegaan door te zorgen voor een hygiënische zorg- en leefomgeving.	O	O	O	O	VI	O	I	O	N	N	O	I	O	O	I
- De verspreiding van MRSA kan worden tegengegaan door correct om te gaan met besmet (klinisch) afval en linnengoed.	O	O	O	O	I-VI	O	I	O	O	O	O	O	O	O	I
- *Patiënten die besmet zijn met MRSA moeten in het ziekenhuis geïsoleerd verpleegd worden.*	O	VI	VI	O	VI	VI	VI	VI	I	I	~	~	~	~	~
Reservoir															
- MRSA kan in het bloed, de slijmvliezen (zoals neus en keel), het haar en op de huid voorkomen.	O	N	O	O	VI	O	N	O	O	O	O	N	O	N	O
Verspreiding															
- MRSA kan voorkomen op bijvoorbeeld vloeren, toiletten of medische apparatuur, en zich via aanraking verder verspreiden.	O	O	O	O	VI	O	I*	O	O	O	O	O	O	O	I
- MRSA kan zich verspreiden door huid-op-huid contact.	O	VI	O	I	VI	O	VI	I	VI	VI	O	VI	I	I	VI
- MRSA kan van dier op mens worden overgebracht.	O	VI	O	O	VI	O	I	O	O	O	O	I	O	I*	I-VI
- MRSA kan in Nederland worden verspreid door mensen die in het buitenland zijn geweest.	O	VU	O	O	VI	O	O	O	O	O	O	I*	O	O	I

VU → Very Unimportant, U → Unimportant, N → Neutral, I → Important, VI → Very Important,– → Not yet included in Delphi, O → No consensus reached,

** → Unanimously rated, Italicized → Included in final item list, ~ → Removed from Delphi after concensus is reached.*

Table 18 cont.: Overview of Consensus on MRSA Knowledge Items After Each Delphi Round

Items	RONDE 1					RONDE 2					RONDE 3				
	Overall (22)	Arts-microbioloog (4)	Ziekenhuis hygiënist (6)	GGD (6)	(omgeving) patiënt (6)	**Overall (19)**	Arts-microbioloog (3)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)	**Overall (20)**	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
Gevolgen															
- Een MRSA-besmetting kan een infectie veroorzaken.	O	I-VI	I-VI	O	VI	O	VI*	I	O	O	O	VI	I	I	VI
- Een MRSA-infectie kan lijden tot overlijden van de patiënt.	O	O	O	O	VI	O	VI	O	O	O	O	VI	O	O	VI
- Een patiënt die besmet is met MRSA blijft gemiddeld langer in het ziekenhuis dan een patiënt zonder MRSA-besmetting.	O	VI	O	O	I-VI	O	VI	O	O	O	O	O	O	O	O
- Als je als patiënt met MRSA besmet raakt, is dat niet jouw schuld.	–	–	–	–	–	O	VI	VI	O	I	O	VI	VI	I	VI
Risicofactoren															
- Onhygiënische omstandigheden verhogen de kans op het besmet raken met MRSA.	O	O	O	O	VI	O	VI	O	O	O	O	O	O	O	VI
- Wonden of andere huidafwijkingen verhogen de kans op een MRSA-infectie.	O	I	O	O	VI	O	VI	I	O	O	O	I-VI	I	O	I
- *Een recente buitenlandse ziekenhuisopname verhoogt de kans op het besmet raken met MRSA.*	O	VI	I	I	VI	O	VI	O	VI	VI	VI	I-VI	I	I-VI	VI
- Huid-op-huid-contact verhoogt de kans op het besmet raken met MRSA.	O	I	I	O	I-VI	O	I*	O	O	O	O	VI	O	I	I
- Huidproblemen zoals eczeem verhogen de kans op een MRSA-infectie.	O	I-VI	O	O	O	O	I	O	I	I	O	I	O	O	O
- Oraal ingenomen medicatie geeft minder risico op infectie dan medicatie die via een infuus wordt toegediend.	–	–	–	–	–	O	I	O	O	O	O	VU	O	VU	I-VI
Herkomst															
- MRSA komt voor in ziekenhuizen.	O	I-VI	I-VI	O	VI	O	I	O	O	O	O	I	I	I	VI
- MRSA komt voor in verpleeghuizen.	O	I	I	O	VI	O	I	I	O	O	O	I	I	O	I-VI
- MRSA komt voor buiten zorginstellingen, in de 'gewone' samenleving.	O	O	I	O	VI	O	VI	O	O	O	O	O	O	O	O
- MRSA komt voor bij vee, zoals varkens en kalveren.	O	I-VI	I	N	VI	O	VI	I	O	O	O	VI	I	I	O

VU → Very Unimportant, U → Unimportant, N → Neutral, I → Important, VI → Very Important,– → Not yet included in Delphi, O → No consensus reached,

** → Unanimously rated, Italicized → Included in final item list, ~ → Removed from Delphi after concensus is reached.*

Table 18 cont.: Overview of Consensus on MRSA Knowledge Items After Each Delphi Round

Items	RONDE 1					RONDE 2					RONDE 3				
	Overall (22)	Arts-microbioloog (4)	Ziekenhuis hygiënist (6)	GGD (6)	(omgeving) patiënt (6)	**Overall (19)**	Arts-microbioloog (3)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)	**Overall (20)**	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
Behandeling															
- Tijdige behandeling van een MRSA-besmetting verlaagt het aantal MRSA infecties en het sterftecijfer ten gevolge van MRSA.	O	VI	O	O	VI	O	VI*	O	O	O	O	I-VI	O	N	VI
- Een MRSA-infectie kan alleen bestreden worden met specifieke antibiotica.	O	VI	O	O	VI	O	VI*	O	O	O	O	VI	O	O	VI
- De meeste antibiotica zijn niet effectief tegen een MRSA infectie.	O	VI	O	O	VI*	O	VI	O	O	O	O	I-VI	O	O	VI
- MRSA kan wel behandeld worden, door specifieke antibiotica of decolonisatie.	–	–	–	–	–	O	VI*	I	O	VI	O	VI	I	O	VI
- Als bekend is dat iemand MRSA-drager is, kan hij/zij voor een operatie worden behandeld.	–	–	–	–	–	O	VI*	I	N	VI	O	VI	I	N	VI*
- Decolonisatie (behandeling) kan niet preventief worden toegepast op iedereen die verhoogd risico loopt.	–	–	–	–	–	O	I	O	O	O	O	O	O	O	O
MRSA en zwangerschap															
- Er is geen verhoogde kans op complicaties of gevolgen voor de baby als een zwangere vrouw MRSA-drager is. Ook is er geen verband tussen MRSA-dragerschap en miskramen.	–	–	–	–	–	O	I	I	O	VI	O	I	I-VI	O	O
- Bij MRSA-infectie tijdens zwangerschap/bevalling is de kans op infecties of andere aandoeningen groter dan normaal.	–	–	–	–	–	O	I	O	O	VI	O	O	O	O	I
- *Het is van belang dat men tijdens het geven van borstvoeding goed de handen wast en kolfapparatuur goed schoon houdt.*	–	–	–	–	–	O	VI	I	O	VI	I	I-VI	VI	I	VI
Contacten van een MRSA drager															
- *MRSA-dragerschap is niet altijd gevaarlijk voor contacten/huisgenoten, behalve wanneer zij verhoogd risico lopen (huidziekten, slechte gezondheid).*	–	–	–	–	–	O	VI*	VI	I	VI	I	VI	I	VI	I
- Behandeling van contacten van MRSA-dragers is niet altijd zinvol.	–	–	–	–	–	O	I	O	O	VI	O	I	I	I	O
- *Mensen moeten goed geïnformeerd worden wat men moet doen wanneer een gezinslid community (samenleving) MRSA-geïnfecteerd is binnen een gezin.*	–	–	–	–	–	O	I	VI	I	VI	I	VI	I	I	I

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Table 19: Overview of Consensus on MRSA Information Sources Items After Each Delphi Round

Items	RONDE 2					RONDE 3				
	Overall (19)	Arts-microbioloog (3)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)	**Overall (20)**	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
- Folders van afdelingen infectiepreventie in zorginstellingen.	O	I	I	I	I	O	I	O	I	I
- De overheid, bijvoorbeeld via postbus 51 initiatieven.	O	I	O	O	VI	O	I	I	O	O
- Kranten en weekbladen.	O	I	O	O	O	O	I	O	O	I
- Verschillende televisie-uitzendingen.	O	I	I	O	O	O	I	I	O	O
- Posters in ziekenhuizen zelf.	O	VI	N	O	I	O	VI	O	O	VI
- Internet algemeen	O	I	O	O	I	O	I	I	O	I
- Internet forum	O	I	I	O	VI	O	O	I	O	VI
- www.rivm.nl/MRSA	O	I	I	I	VI	O	O	I	O	I
- www.rivm.nl/cib	O	I	I	O	O	O	O	I	I	I-VI
- www.wip.nl	O	U	O	O	O	O	O	O	U	I-VI
- www.MRSA-net.nl	O	VI	VI	O	VI	O	VI	I	I	VI
- www.google.nl	O	I	O	O	I	O	O	O	O	I
- www.eursafety.eu	O	VI	O	O	O	O	O	O	O	O
- www.ggd.nl	O	N	O	O	VI	O	N	VI	N	VI
- www.wikipedia.nl	O	I	O	O	I	O	I	O	O	VI
- *Behandelend arts*	O	I	O	I	VI	VI	VI	VI	I-VI	VI
- *Verpleegkundige*	O	I	O	O	VI	VI	VI	VI	I	VI
- GGD	O	I	I	I	VI	I	I	VI	I	I
- Infectiepreventieadviseur	O	I	VI	O	VI	O	I	VI	O	VI
- *Huisarts*	VI	VI	VI	I	VI	~	~	~	~	~
- Apotheek	O	O	I	O	VI	O	O	O	O	VI

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Table 20: Overview of Consensus on ASP Knowledge Items After Each Delphi Round

Items	RONDE 1					RONDE 2					RONDE 3				
	Overall (22)	Arts-microbioloog (4)	Ziekenhuis hygiënist (6)	GGD (6)	(omgeving) patiënt (6)	**Overall (19)**	Arts-microbioloog (3)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)	**Overall (20)**	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
Antibiotica															
- Het is belangrijk dat een antibioticakuur helemaal afgemaakt wordt.	O	O	VI	VI	VI*	O	I	VI	VI	VI*	O	I	VI	VI	VI
- Het is belangrijk dat zo min mogelijk gebruik wordt gemaakt van breed-spectrum antibiotica (met name derde generatie cephalosporins en floroquinolones).	O	VI	O	U	VI	O	VI	O	O	VI	O	I	O	O	VI
- Het is belangrijk dat voorkomen wordt dat een voorgeschreven antibioticakuur te lang of te kort is.	O	O	O	O	VI*	O	I	I	O	VI*	O	I	VI	O	VI
- Antibiotica werken niet tegen virussen.	O	VI	O	O	VI*	O	VI	O	O	VI	O	VI	O	I	VI
- Antibiotica werken niet tegen verkoudheid of hoesten.	O	O	VI	O	VI*	O	I	VI	I-VI	VI	O	VI	O	VI	VI
- Antibiotica kunnen bacteriën doden.	O	O	O	N	VI	O	I	O	N*	VI	O	N	O	N	VI
- In de veeteelt worden antibiotica ook preventief voorgeschreven, waardoor het risico op resistente bacteriën toeneemt.	O	VI	O	O	VI*	O	VI	I	VI	VI	O	VI	VI	I	O
- Op de huid en in de buik leven normaal gesproken bacteriën die goed zijn voor de gezondheid.	O	O	O	O	VI*	O	VI	O	O	VI*	O	VI	I-VI	O	VI*
- Antibiotica kunnen de 'goede' bacteriën die op de huid en in de buik leven ook doden.	O	O	O	I*	VI	O	VI	O	O	VI	O	I	I	O	VI
Resistentie															
- *Als te veel antibiotica worden gebruikt, is het minder waarschijnlijk dat ze ook in de toekomst goed werken..*	O	VI	VI	O	VI*	VI	VI*	I	I-VI	VI*	~	~	~	~	~
- *Door overmatig gebruik van antibiotica ontstaan steeds meer resistente bacteriën*.	VI	VI	VI	I-VI	VI*	~	~	~	~	~	~	~	~	~	~
- Een infectie die veroorzaakt is door een resistente bacterie is moeilijk te behandelen.	O	VI	I-VI	I	VI*	O	VI*	O	I	VI*	O	VI	I	VI	VI*
- *Bacteriën kunnen resistent worden tegen antibiotica.*	O	VI	I-VI	I	VI*	O	VI	I	O	VI*	VI	VI	I	I	VI
- Iedereen kan besmet raken met een bacterie die resistent is tegen een of meerdere soorten antibiotica.	O	O	VI	O	VI	O	I	O	O	VI*	O	I	I	O	VI*

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Table 20 cont.: Overview of Consensus on ASP Knowledge Items After Each Delphi Round

Items	RONDE 1					RONDE 2					RONDE 3				
	Overall (22)	Arts-microbioloog (4)	Ziekenhuis hygiënist (6)	GGD (6)	(omgeving) patiënt (6)	**Overall (19)**	Arts-microbioloog (3)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)	**Overall (20)**	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
Beperkt antibioticagebruik															
- *Patiënten zouden geen antibiotica die niet voor hen bedoeld zijn moeten gebruiken.*	–	–	–	–	–	O	VI*	VI	I	VI*	VI	VI	VI	VI	VI*
- Patiënten zouden niet zelf naar antibiotica moeten vragen bij de huisarts, zodat deze zich niet onder druk gezet voelt om antibiotica voor te schrijven.	–	–	–	–	–	O	VI	O	O	VI	O	VI	I-VI	O	VI
- *Patiënten die in een ziekenhuis opgenomen zijn kunnen op een nette manier kritische vragen stellen aan hun behandelend arts over de noodzaak van voorgeschreven antibiotica.*	–	–	–	–	–	O	I	O	I	VI	VI	VI	VI	I	VI*
- Alternatieven voor het 'paardenmiddel' antibiotica moeten worden overwogen bij een behandeling.	–	–	–	–	–	O	I	O	O	VI	O	VI	I	O	VI*
Correct gebruik antibiotica															
- *Patiënten moeten er zelf op letten dat zij de antibiotica volgens voorschrift gebruiken, ook na het verlaten van het ziekenhuis.*	–	–	–	–	–	VI	VI*	I	VI	VI*	~	~	~	~	~

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Table 21: Overview of Consensus on ASP Information Sources Items After Each Delphi Round

Items	RONDE 2					RONDE 3				
	Overall (19)	Arts-microbioloog (3)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)	**Overall (20)**	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
- Er is te weinig informatie over antibiotica gebruik beschikbaar voor burgers.	O	VI	I	O	O	O	I	I	O	VI
- Patiënten moeten gestimuleerd worden meer informatie over antibioticagebruik te lezen.	O	I	O	N	VI*	O	O	I	O	VI*
- Aanvullende informatiebronnen over antibioticagebruik voor burgers zijn niet nodig.	O	VU	O	O	O	O	O	N	N	O
- Folders van afdelingen infectiepreventie.	O	I	O	O	VI	O	I	O	O	VI
- Kranten en weekbladen.	O	I	O	O	I	O	I	O	O	I-VI
- Verschillende televisie-uitzendingen.	O	I	I	O	VI	O	I	I*	O	I
- Bijsluiter van de medicatie.	O	I	I	O	VI*	O	VI	VI	I	VI
- De overheid, bijvoorbeeld via postbus 51 initiatieven.	O	I	O	O	I	O	I	I	O	I
- Internet algemeen	O	I	O	O	VI	O	I	O	O	I-VI
- www.eursafety.eu	O	I*	O	O	O	O	O	O	O	I-VI
- www.rivm.nl/cib	O	I	I	O	VI	O	O	I	I	VI
- www.google.nl	O	N	O	O	VI	O	O	O	O	I-VI
- www.MRSA-net.nl	O	I	I	O	VI	O	O	VI	O	VI
- ecdc.europa.eu	O	I*	O	O	O	O	N	O	O	O
- *Behandelend arts*	VI	VI	VI	VI	VI	~	~	~	~	~
- Verpleegkundige	O	I	VI	I	VI	O	VI	I-VI	O	VI*
- GGD	O	N	I	O	VI*	O	O	I-VI	O	VI*
- *Huisarts*	VI	VI*	VI	I-VI	VI*	~	~	~	~	~
- *Medisch specialist*	VI	VI	VI	I-VI	VI*	~	~	~	~	~
- *Apotheek*	O	I	VI	I	VI*	VI	I-VI	VI	I	VI

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Table 22: Overview of consensus on overarching categories.

Overarching categories	RONDE 3				
	Overall (20)	Arts-microbioloog (2)	Ziekenhuis hygiënist (5)	GGD (6)	(omgeving) patiënt (5)
- *Algemene kennis over wat MRSA is.*	I	I-VI	I	I	VI*
- De herkomst van MRSA.	O	VI	I	O	VI
- Risicofactoren voor MRSA.	O	I-VI	I	O	VI
- Behandeling van MRSA.	O	I	I	O	VI*
- Verspreiding van MRSA.	O	VI	I	O	VI*
- Maatregelen om verspreiding van MRSA tegen te gaan.	O	I	I	O	VI
- Gevolgen van MRSA.	O	I-VI	O	O	VI
- Schuldgevoelens bij MRSA.	O	VI	I-VI	O	O
- MRSA en zwangerschap.	O	O	O	O	I
- Wat kan/moet men zelf doen om de verspreiding van MRSA tegen te gaan.	O	I	I	O	VI
- *Wat moet men doen als een contact/huisgenoot besmet is met MRSA.*	I	I	I	I	VI*
- De werking van antibiotica.	O	N	O	O	VI
- *Risico's van antibioticagebruik (resistentie).*	VI	I-VI	I	I-VI	VI*
- Maatregelen om resistentie te voorkomen.	O	I	I	I	VI*
- *Wat kan/moet men zelf doen om resistentie te voorkomen.*	I	I*	I	I-VI	VI
- Waar men betrouwbare informatie kan vinden over MRSA en antibioticagebruik.	O	I	I	VI	VI*

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Appendix E: Overview of round two argumentations for high- and low-importance

Arguments for high-importance	Arguments for low-importance
MRSA is een ziekenhuisbacterie	
Het is belangrijk dat burgers dit weten omdat daar de grootste problemen zichtbaar zijn en om te benadrukken dat (hygiëne maatregelen) binnen ziekenhuizen van groot belang zijn.	*Het is niet belangrijk dat mensen dit weten omdat er juist ook een duidelijke toename is in CA-MRSA (samenleving) en LA-MRSA (vee).*
Patiënten die eerder besmet of geïnfecteerd zijn geweest met de MRSA-bacterie moeten dit bij opname in een Nederlands ziekenhuis direct melden, zodat zij gescreend kunnen worden op MRSA-besmetting.	
Het melden van een eerdere besmetting of infectie is van belang omdat deze patiënten de hoogste kans hebben om opnieuw besmet te raken.	*Het melden van een eerdere besmetting of infectie is niet nodig omdat dit stigmatiserend werkt, opnieuw screenen van iedereen die ooit drager is geweest duur is en dragerschap in het verleden mag de patiënt niet blijven 'achtervolgen'.*
De verspreiding van MRSA kan worden tegengegaan door het strikt toepassen van desinfectiemaatregelen en handhygiëne.	
Het is van belang dat patiënten op de hoogte zijn van het belang van desinfectiemaatregelen en handhygiene om dat zij dan bij kunnen dragen aan optimale toepassing door zorgverleners.	*De verantwoordelijkheid voor het toepassen van desinfectiemaatregelen en handhygiëne ligt bij zorgverleners en is daarom minder van belang voor patiënten.*
De verspreiding van MRSA kan worden tegengegaan door het gebruik van persoonlijke beschermingsmiddelen (schort, mondneusmasker, etc.)	
Als burgers op de hoogte zijn van het belang van persoonlijke beschermingsmiddelen, is het voor hen minder beangstigend als zij als patiënt worden behandeld door mensen met bijvoorbeeld mondmaskers en schorten voor.	*Het gebruik van persoonlijke beschermingsmiddelen is alleen van belang voor zorgverleners, niet voor patiënten en hun bezoekers.*
De verspreiding van MRSA kan worden tegengegaan door te zorgen voor een hygiënische zorg- en leefomgeving.	
Een hygiënische zorg- en leefomgeving zijn van belang bij het voorkomen van de verspreiding van alle overdraagbare organismen die infecties kunnen veroorzaken, waaronder CA-MRSA.	*Het belang van hygiënische zorg- en leefomgeving is niet relevant voor burgers omdat het niet zozeer te maken heeft met ziekenhuis-MRSA en omdat men in een leefomgeving ook 'moet kunnen leven'.*
De verspreiding van MRSA kan worden tegengegaan door correct om te gaan met besmet (klinisch) afval en linnengoed.	
Dit is relevante informatie omdat MRSA het vaakst verspreid via contact, daar speelt secuur omgaan met besmet afval een rol in.	*Dit is voor burgers geen relevante informatie omdat zijn, ook als patiënt, niet in aanraking komen met dit afval. Dit is puur een aangelegenheid voor zorgverleners.*
MRSA kan in het bloed, de slijmvliezen (zoals neus en keel), het haar en op de huid voorkomen.	
Mensen zullen iets moeten weten over waar de bacterie zit om de maatregelen te kunnen begrijpen.	*Deze kennis voegt voor patiënten niets toe, het is belangrijker dat zij op de hoogte zijn van wat zij kunnen doen om besmetting of verspreiding te voorkomen.*
MRSA kan voorkomen op bijvoorbeeld vloeren, toiletten of medische apparatuur, en zich via aanraking verder verspreiden.	
De basis van hygiënische maatregelen is altijd desinfectie van oppervlakten en vooral apparatuur, niet voor niets worden 'besmette afdelingen' grondig gedesinfecteerd. Als burgers dit weten zullen zij als patiënt ook beter handhygiëne toepassen.	*Deze kennis is vooral van belang voor zorgverleners, burgers kunnen niets met deze informatie.*
MRSA kan zich verspreiden door huid-op-huid contact.	
Huid op huid contact is de belangrijkste bron van overdracht van MRSA. Als burgers dit weten kunnen zij als patiënt beter begrijpen hoe zij verspreiding kunnen voorkomen.	*Dit hoeven burgers niet te weten omdat het maar één van de mogelijke routes voor verspreiding is.*
MRSA kan van dier op mens worden overgebracht.	
Dit is belangrijke informatie voor burgers omdat LA-MRSA (vee) een steeds belangrijker route van besmetting wordt. Ook begrijpt men dan beter waarom veehouders verhoogd	*Dit hoeven niet alle burgers te weten omdat het veel onrust kan veroorzaken terwijl het alleen relevant is voor bijvoorbeeld veehouders.*

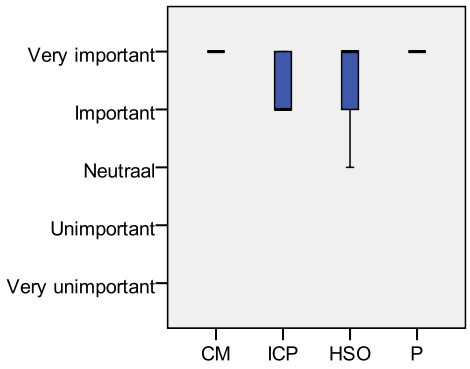
risico lopen en het belang van handhygiëne na contact met dieren.

MRSA kan in Nederland worden verspreid door mensen die in het buitenland zijn geweest.	
In buitenlandse ziekenhuizen komt meer MRSA voor dan in Nederlandse ziekenhuizen, daarom is deze kennis van belang voor burgers.	*MRSA verspreiding vanuit het buitenland vindt in feite alleen plaats wanneer mensen in een buitenlands ziekenhuis opgenomen zijn geweest.*
Een MRSA-besmetting kan een infectie veroorzaken.	
Dit is bijzonder relevant omdat, wanneer MRSA geen infectie zou kunnen veroorzaken, alle maatregelen niet nodig zouden zijn.	*Door deze kennis te benadrukken kunnen besmette patiënten zich veel zorgen gaan maken.*
Een MRSA-infectie kan lijden tot overlijden van de patiënt.	
Dit is belangrijke kennis omdat dit een zeer goede motivator is tot naleven van maatregelen ter voorkoming van (verspreiding van) MRSA.	*Deze kennis moet niet benadrukt worden in educatie van burgers, omdat zij dan te bang kunnen worden.*
Een patiënt die besmet is met MRSA blijft gemiddeld langer in het ziekenhuis dan een patiënt zonder MRSA-besmetting.	
Deze kennis is niet alleen van belang voor kosten van de gezondheidszorg maar ook voor het vergroten van het besef van infectie preventie en –controle.	*Dit is voor burgers geen relevante kennis omdat patiënten hier geen invloed op hebben.*
Onhygiënische omstandigheden verhogen de kans op het besmet raken met MRSA.	
Dit is belangrijke kennis om patiënten te laten weten dat de hygiënishe maatregelen heel belangrijk zijn.	*Burgers/patiënten zullen niet weten wat zij met deze informatie moeten doen.*
Wonden of andere huidafwijkingen verhogen de kans op een MRSA-infectie.	
Wonden zijn een belangrijke risicofactor voor MRSA, het is relevant dat burgers dit weten omdat zij dan als patiënt zelf ook op kunnen letten als zij wonden hebben.	*Deze kennis is voornamelijk van belang voor mensen op bepaalde afdelingen binnen het ziekenhuis of wanneer er contact is met derden.*
Een recente buitenlandse ziekenhuisopname verhoogt de kans op het besmet raken met MRSA.	
Ditis een belangrijke bron van MRSA in Nederland. Burgers moeten dit weten om zich bewust te zijn van hun verantwoordelijkheden (voor screening) bij opname in een Nederlands ziekenhuis.	*Het is niet nodig dat alle burgers hiervan op de hoogte zijn omdat dit alleen specifiek voor patiënten die in het buitenland opgenomen zijn geweest geldt.*
Huid-op-huid-contact verhoogt de kans op het besmet raken met MRSA.	
Dit is belangrijke kennis om burgers en patiënten duidelijk te maken hoe snel overdracht kan plaatsvinden.	*Dit is minder relevante informatie omdat het van de specifieke situatie afhangt of er risico's zijn (alleen als één van beide drager is, bij wonden etc)*
Huidproblemen zoals eczeem verhogen de kans op een MRSA-infectie.	
Dit is belangrijk om burgers te helpen bewust te zijn van de risico's, ook wanneer zij zelf bijvoorbeeld eczeem hebben en een MRSA besmette patiënt bezoeken.	*Deze informatie heeft weinig meerwaarde voor patiënten.*
MRSA komt voor in ziekenhuizen.	
Dit is relevante kennis omdat het juist weergeeft waarom het voor burgers belangrijk kan zijn: iedereen kan patiënt worden.	*Dit is misleidend omdat MRSA ook buiten ziekenhuizen voorkomt.*
MRSA komt voor in verpleeghuizen.	
Dit is belangrijk omdat dit steeds vaker voorkomt en er daardoor ook veel vragen veroorzaakt.	*Dit is minder belangrijk omdat MRSA in Nederlandse verpleeghuizen minder voorkomt dan in ziekenhuizen.*
MRSA komt voor buiten zorginstellingen, in de 'gewone' samenleving.	

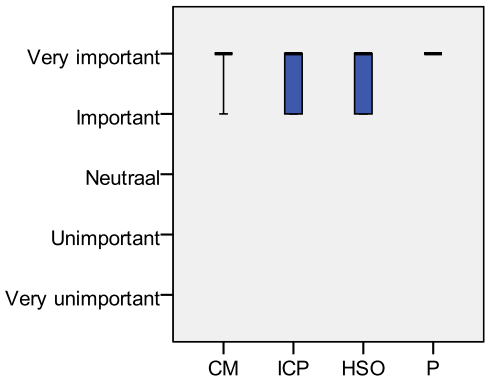
Het is van belang dat burgers zich realiseren dat MRSA niet alleen een probleem is in ziekenhuizen, als men patiënt is.	*Dit is niet relevant omdat gezonde burgers vaak geen last hebben van MRSA besmetting en er vanzelf weer vanaf komen.*
MRSA komt voor bij vee, zoals varkens en kalveren.	
Dit is belangrijke kennis om mensen uit deze sector bewust te maken dat zij dit moeten melden bij opname en voor bewustwording van hoge antibioticagebruik in de veehouderij.	*Deze kennis is voor een gewone burger, die niet in de veeteelt werkt niet zo relevant en hoeft daarom niet meegenomen te worden in educatie.*
Tijdige behandeling van een MRSA-besmetting verlaagt het aantal MRSA infecties en het sterftecijfer ten gevolge van MRSA.	
Dit is belangrijk omdat het verklaart waarom preventie en screening nodig zijn.	*Het is voor burgers belangrijker te weten wat preventieve maatregelen zijn en DAT er behandeld kan worden.*
Een MRSA-infectie kan alleen bestreden worden met specifieke antibiotica.	
Het is van belang hier aandacht aan te besteden in educatie om mensen bewust te laten nadenken over antibioticagebruik en om de kern van het probleem van MRSA duidelijk te maken (de problemen voor behandeling).	*Burgers hoeven dit niet te weten omdat het patiënten niet uitmaakt met welke soort antibiotica ze worden behandeld, als ze maar behandeld worden.*
De meeste antibiotica zijn niet effectief tegen een MRSA infectie.	
Het is belangrijk hier aandacht aan te besteden in educatie om burgers bewust te maken van het belang van verantwoord antibioticagebruik .	*Deze kennis is niet van belang voor burgers omdat zij op hun arts vertrouwen voor het voorschrijven van (geschikte) antibiotica.*
Het is belangrijk dat een antibioticakuur helemaal afgemaakt wordt.	
Het is belangrijk dat burgers dit weten omdat een duidelijke boodschap moet worden uitgedragen naar burgers. Over het algemeen zal een antibioticakuur afgemaakt moeten worden, tenzij men bijzondere medische redenen heeft, daarom als 'vuistregel' wel benadrukken dat het afmaken van de kuur belangrijk is.	*Dit moet niet worden benadrukt omdat een antibioticakuur niet altijd afgemaakt moet worden, als bijvoorbeeld een ander antibioticum beter geschikt blijkt te zijn moet toch worden overgestapt.*
Het is belangrijk dat zo min mogelijk gebruik wordt gemaakt van breed-spectrum antibiotica (met name derde generatie cephalosporins en floroquinolones).	
Dit is belangrijke kennis omdat deze antibiotica niet alleen de ziekteverwekkers doden, maar ook een deel van de beschermende bacteriën die in het lichaam voorkomen. Daarnaast wordt zo resistentie tegen deze antibiotica, die nodig zijn bij bijvoorbeeld onduidelijke diagnose, voorkomen.	*Dit hoeven burgers niet te weten omdat dit vooral in de handen van de voorschrijvende arts ligt.*
Het is belangrijk dat voorkomen wordt dat een voorgeschreven antibioticakuur te lang of te kort is.	
Dit moeten burgers weten zodat zij mee kunnen denken over hun eigen medicatie en te motiveren de antibiotica kuur af te maken.	*Dit hoeven burgers niet te weten omdat dit vooral relevant is voor de arts.*
Antibiotica werken niet tegen virussen.	
Dit moeten burgers weten om te voorkomen dat zij bij een arts om een antibioticum vragen, het blijkt namelijk dat een arts hier dan soms toch in meegaat om de patiënt tevreden te houden.	*Dit hoeven burgers niet te weten omdat dit vooral aan de arts is.*
Antibiotica werken niet tegen verkoudheid of hoesten.	
Dit moeten burgers weten om te voorkomen dat zij (vooral in de winter) bij hun arts om een antibioticum vragen.	*Dit hoeven burgers niet te weten omdat dit vooral aan de arts is.*
Antibiotica kunnen bacteriën doden.	
Dit moeten burgers weten om de uitleg van hun arts te begrijpen over welke medicatie voorgeschreven wordt en waarom.	*Burgers hoeven dit niet te weten omdat zij alleen willen dat een antibioticum werkt, het maakt hen verder niet uit hoe dit gebeurt.*

In de veeteelt worden antibiotica ook preventief voorgeschreven, waardoor het risico op resistente bacteriën toeneemt.	
Dit is belangrijke informatie voor burgers, omdat zo sociale druk kan ontstaan om op te treden tegen het grote antibiotica gebruik in de veeteelt en burgers te stimuleren verantwoord vlees te kopen.	*Dit hoeven burgers niet te weten, zij moeten alleen weten hoe zij met eventueel besmet vlees moeten omgaan.*
Op de huid en in de buik leven normaal gesproken bacteriën die goed zijn voor de gezondheid.	
Dit is belangrijke informatie omdat anders het risico bestaat dan burgers bang worden voor bacteriën, terwijl die juist ook heel nuttig zijn voor mensen.	*Deze kennis draagt niet bij tot infectie preventie en –controle, burgers hoeven dit dan ook niet te weten.*
Antibiotica kunnen de 'goede' bacteriën die op de huid en in de buik leven ook doden.	
Dit is belangrijke kennis voor burgers omdat het verklaart waarom voorzichtig omgegaan moet worden met antibiotica en omdat het burgers kan stimuleren kritisch te zijn tegenover het eigen antibioticagebruik.	*Burgers hoeven dit niet te weten omdat zij verder niet veel kunnen met deze informatie.)*
Een infectie die veroorzaakt is door een resistente bacterie is moeilijk te behandelen.	
Dit is belangrijke kennis voor burgers omdat dit de kern van het probleem is en dus verklaart waarom zo voorzichtig omgegaan moet worden met antibiotica.	*Dit hoeven burgers niet te weten omdat de meeste mensen nooit echt met een infectie door een resistente bacterie te maken krijgen.*
Bacteriën kunnen resistent worden tegen antibiotica.	
Dit moeten burgers weten omdat het hen bewust kan maken dat er ook nadelen kleven aan antibiotica.	*Dit hoeft niet meegenomen te worden in educatie aan burgers omdat het redelijk voor de hand liggend is.*
Iedereen kan besmet raken met een bacterie die resistent is tegen een of meerdere soorten antibiotica.	
Het is belangrijk dat burgers dit weten, zodat mensen die wel besmet of geïnfecteerd raken zich niet hoeven te schamen of schuldig hoeven te voelen.	*Dit hoeven burgers niet te weten omdat het belangrijker is te weten dat gezonde mensen de bacterie ook vanzelf weer snel kwijtraken.*

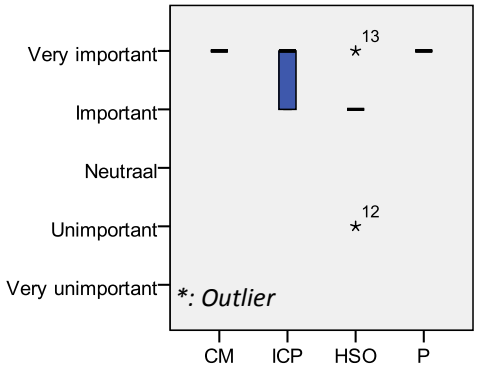
Appendix F: Boxplots of consensus items in round one of the Delphi



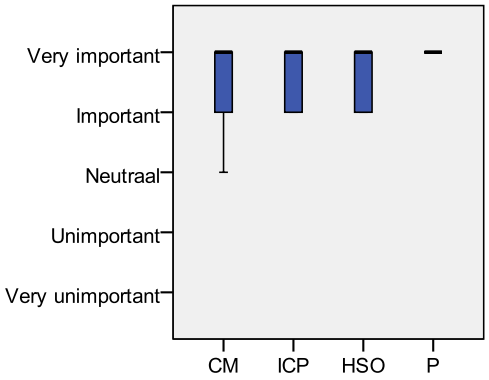
One can be colonized with MRSA without being ill.



Patients who have recently been admitted to a hospital abroad must report this when admitted to a Dutch hospital so they can be screened for MRSA.



Patients who have been admitted to a hospital abroad may be treated in isolation in a Dutch hospital.

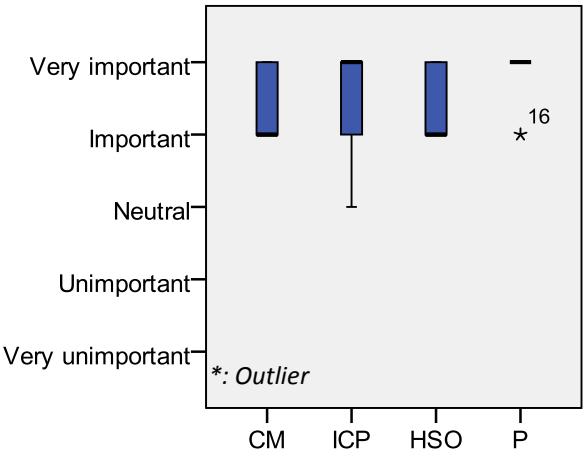


When too much antibiotics are used increasingly many resistant bacteria will develop.

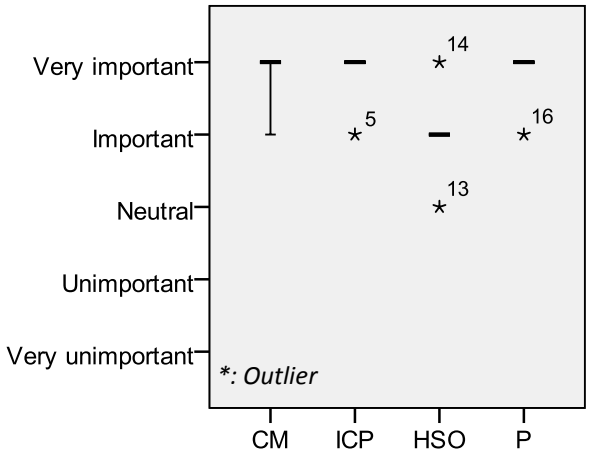
CM: Clinical microbiologist
ICP: Infection Control Professional
HSO: Health Service Organization employee
P: (former) Patient

Appendix G: Boxplots of consensus items in round two of the Delphi

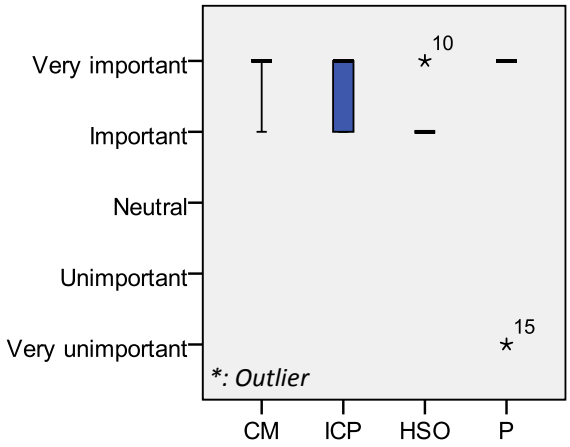
MRSA:



Patients who work with livestock short report so upon admission to a Dutch hospital, so they can be screened for MRSA.



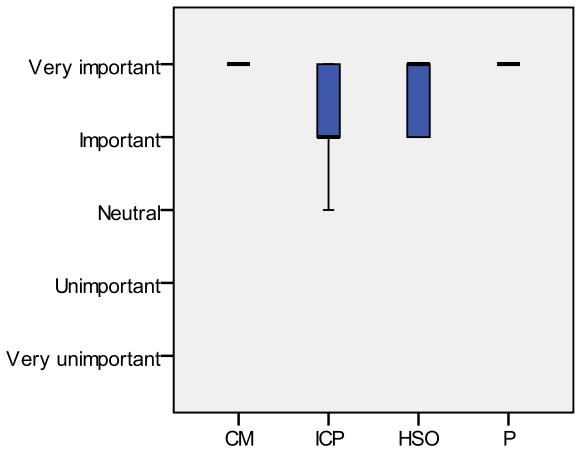
Patients who are colonized with MRSA should be treated in isolation in the hospital.



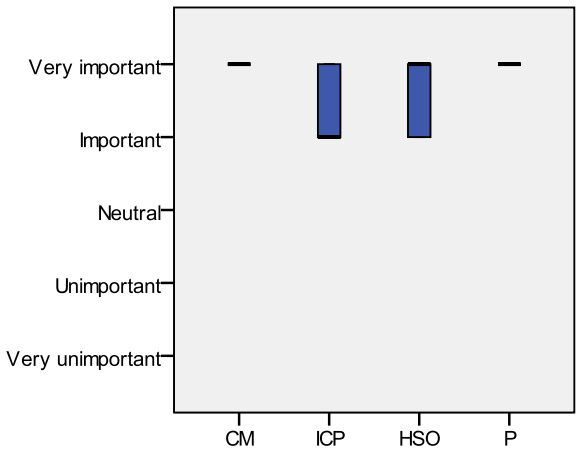
The general practitioner as a source of information on MRSA.

CM: Clinical microbiologist
ICP: Infection Control Professional
HSO: Health Service Organization employee
P: (former) Patient

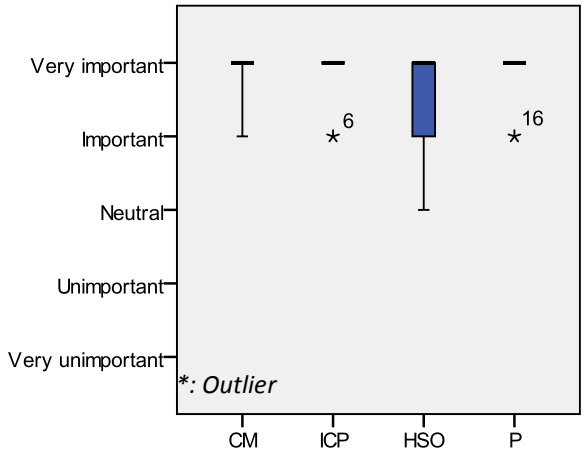
ASP



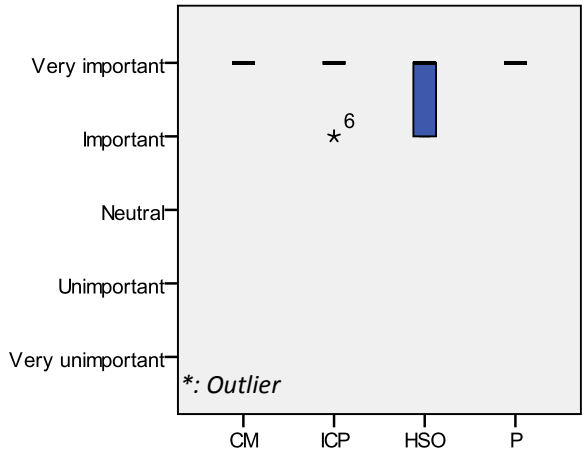
When too much antibiotics are used, they are less likely to work as well in the future.



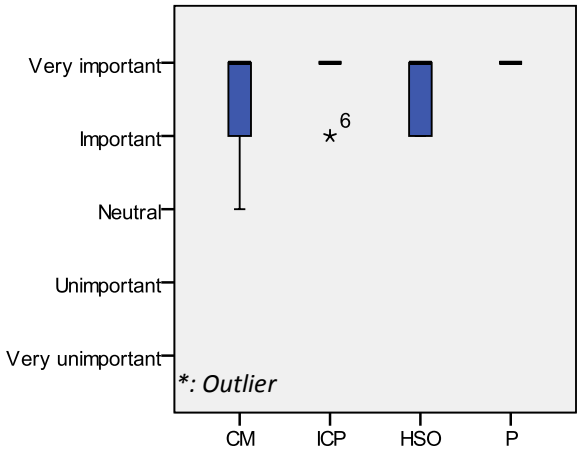
Patients themselves are responsible for using antibiotics according to their prescription, including after leaving the hospital.



The medical doctor who treats the patient as a source of information on ASP.



The general practitioner as a source of information on ASP.

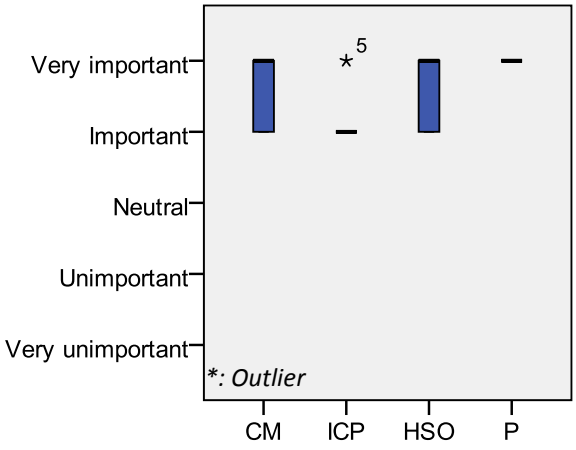


The medical specialist as a source of information on ASP.

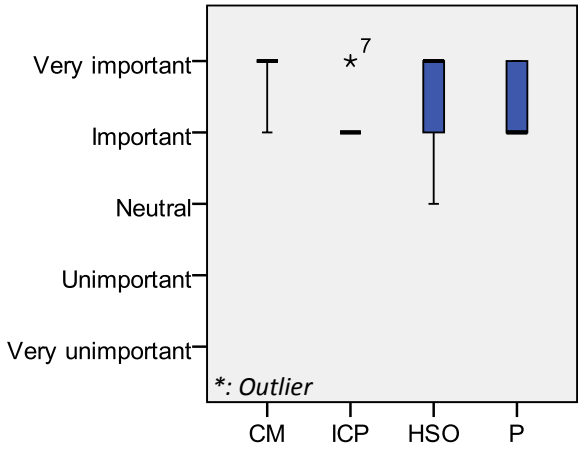
CM: Clinical microbiologist
ICP: Infection Control Professional
HSO: Health Service Organization employee
P: (former) Patient

Appendix H: Boxplots of consensus items of round three of the Delphi

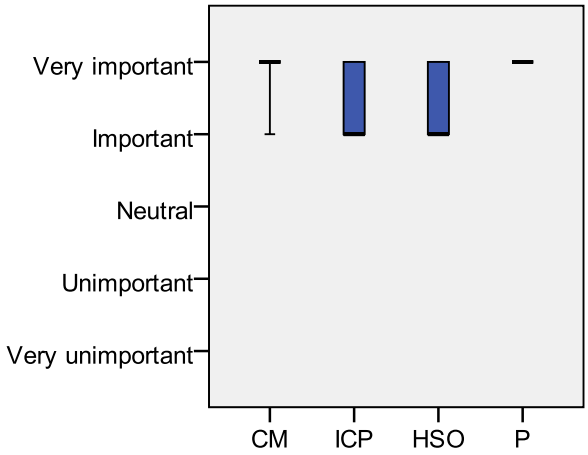
MRSA



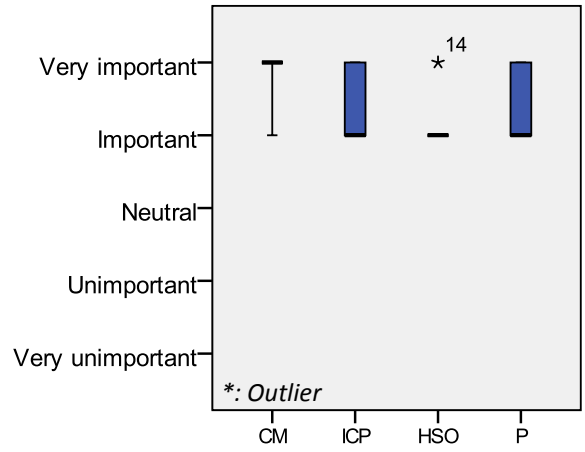
A recent hospitalization abroad increases the risk of MRSA-colonization.



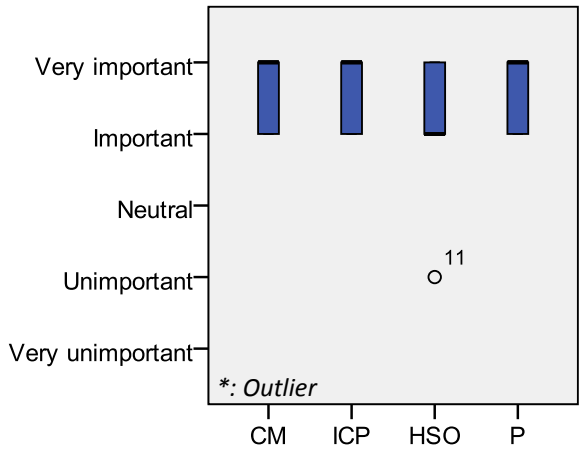
MRSA-colonization is not dangerous for contacts, except for if they already are at higher risk (due to skin disorders or poor health).



Bacteria can become resistant to antibiotics.



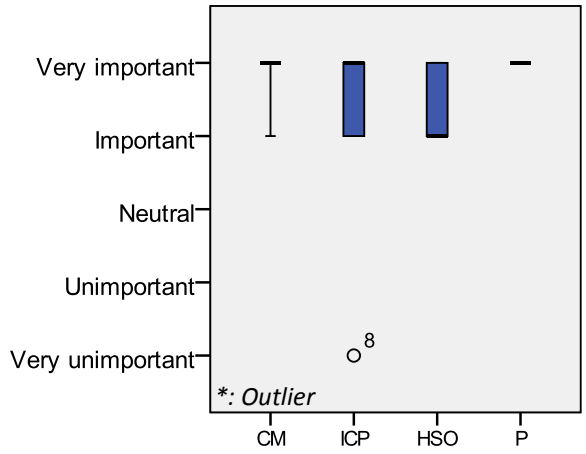
People should be well informed about what to do when a family member is infected with community associated MRSA.



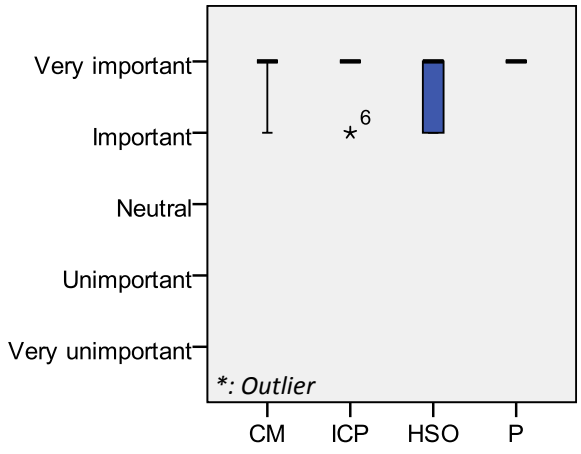
It is important to wash ones hands and keep pump equipment very clean for breast feeding.

CM: Clinical microbiologist
ICP: Infection Control Professional
HSO: Health Service Organization employee
P: (former) Patient

ASP

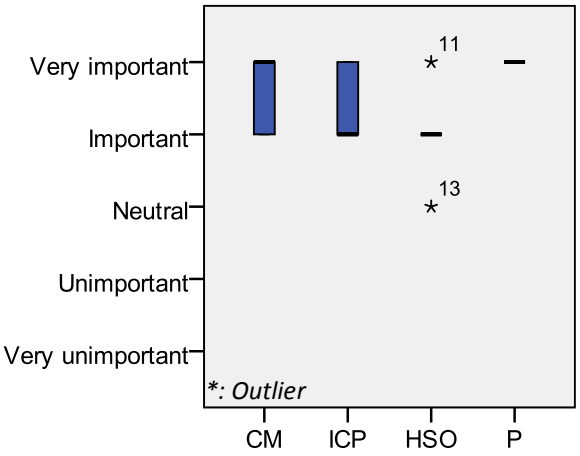


Patients who are hospitalized can politely ask their medical doctor questions about the necessity of prescribed antibiotics.

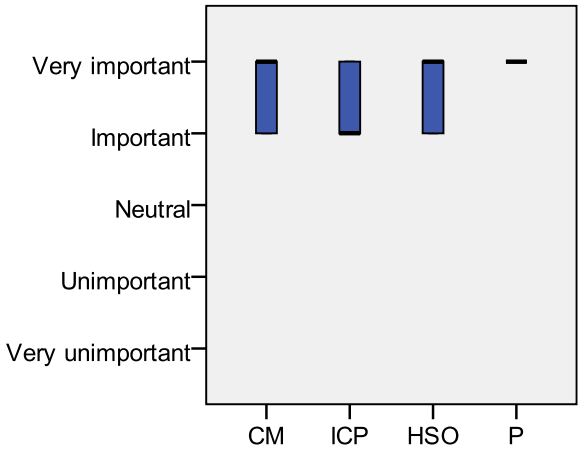


Patients should use antibiotics that were not specifically prescribed to them.

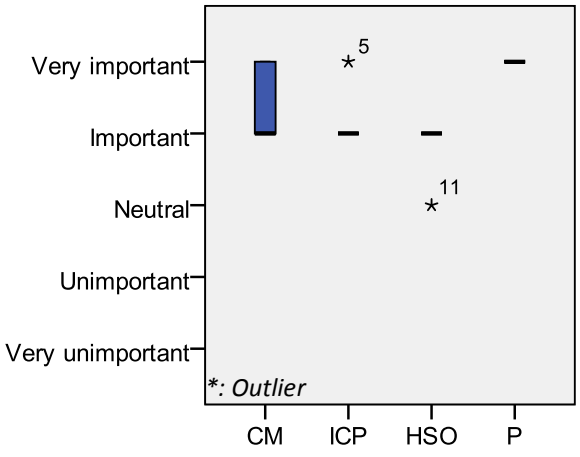
Overarching categories



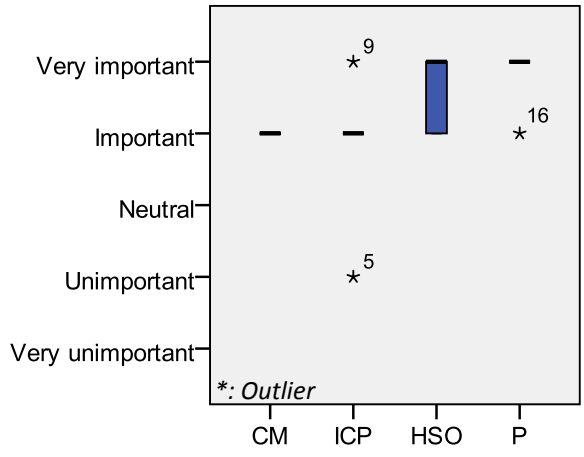
General knowledge on what MRSA is.



Knowledge on risks of antibiotics use (resistance).

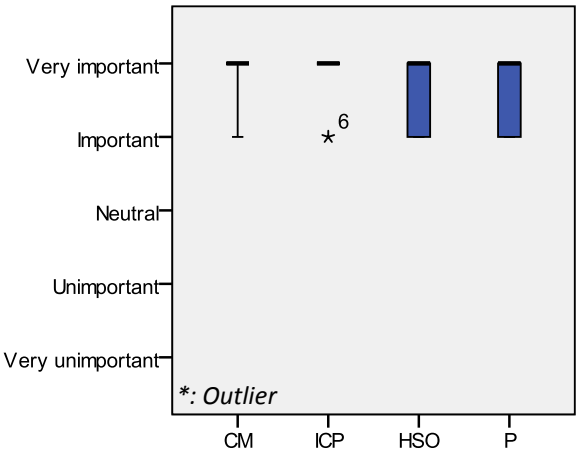


Knowledge on what people should do when a contact/housemate is MRSA-colonized.

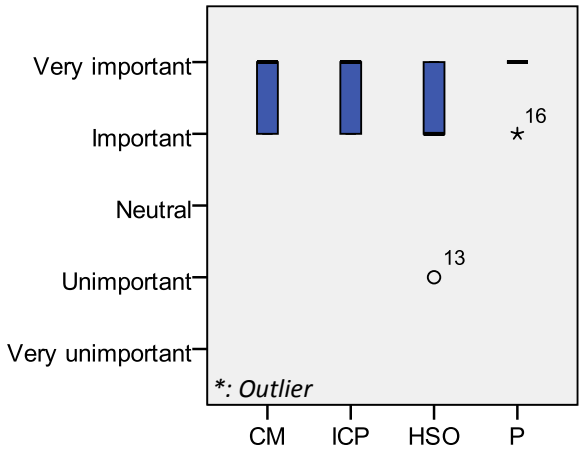


Knowledge on what people can/should do themselves to prevent antibiotics-resistance.

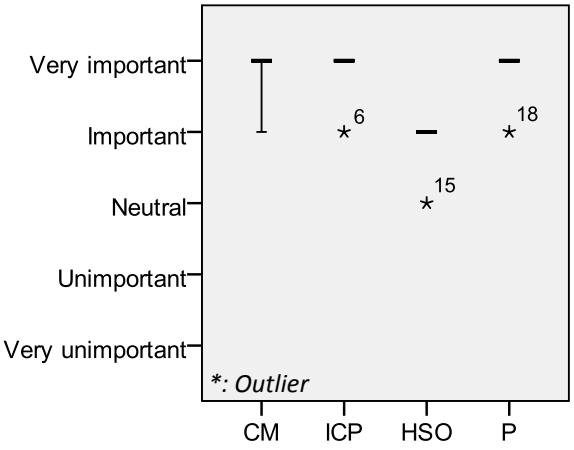
Sources of information



Medical doctor who treats the patient is a source of information on MRSA.



The Pharmacy is a source of information about antibiotics use



Nursing staff is a source of information on MRSA.

CM: Clinical microbiologist
ICP: Infection Control Professional
HSO: Health Service Organization employee
P: (former) Patient