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CARRIAGE OF ESBL (EXTENDED SPECTRUM BETA-LACTAMASES) - PRODUCING BACTERIA - KNOWLEDGE, EMOTIONAL IMPACT AND RISK ASSESSMENT

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CARRIAGE OF ESBL (EXTENDED SPECTRUM BETA-LACTAMASES) - PRODUCING BACTERIA - KNOWLEDGE, EMOTIONAL IMPACT AND RISK ASSESSMENT

THESIS FOR DOCTORAL DEGREE (Ph.D.)

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Människors möte

Byta ett ord eller två gjorde det lätt att gå. Alla människors möte borde vara så.

Hjalmar Gullberg (1898-1961)

ABSTRACT

Antibiotic-resistant bacteria, such as ESBL-producing *Enterobacteriaceae*, have become a growing public health threat. The overall aim of this thesis was to explore how the increasing prevalence of ESBL-producing bacteria affects different groups among the Swedish population.

Paper I described the knowledge and understanding of antibiotic-resistant bacteria, and of the risk of becoming a carrier of such bacteria, among ninety-five Swedish travelers before travel to high-risk areas. A questionnaire was used for data sampling and qualitative content analysis for data analysis. The study shows that the travelers lacked knowledge of antibiotic resistance, that they perceived there to be no risk of acquiring such bacteria during the upcoming trip, and that they distanced themselves from the problem.

In **Paper II** travelers' risk behavior and risk-taking during their travel to a high-prevalence country for ESBL were described. Fifteen persons, who acquired a carriage of ESBL during their trip, were interviewed after homecoming. Grounded Theory was used for data analysis. The low knowledge level of antibiotic-resistant bacteria and transmission routes influenced the participants´ behavior and risk-taking during their journey, resulting in most of them exposing themselves to risk situations of which they were mostly unaware. For the participants it was unclear why they had become carriers of ESBL, and they did not see that it could have been caused by their personal risk behavior.

Paper III comprises the experiences of patients who have become carriers of ESBL, as patients in healthcare and the consequences for their daily life. Seven ESBL-patients were interviewed and Grounded Theory was used for the data analysis. The participants experienced that physicians and other healthcare staff had a poor knowledge of ESBL, resulting in them receiving insufficient and incorrect information, which in turn gave rise to many thoughts and various emotions among the informants. To cope with their daily lives they constructed their own strategies to handle the consequences of ESBL. In contact with healthcare they perceived staff as ignorant, disrespectful and with a nonchalant attitude, and they sometimes felt stigmatized.

In **Paper IV** the consequences for staff in acute care settings and nursing homes caring for patients and residents with ESBL-producing bacteria were described. Interviews were conducted with five Registered Nurses (RNs), five Assistant Nurses (ANs) and three Physicians in acute care settings and five RNs and five RNs in nursing homes. Grounded Theory was used for data analysis. Some fear was present among healthcare staff and it was more frequent in nursing homes than in acute care settings. The fear most often concerned the risk of becoming personally infected or transmitting contagion at home to family and friends. The ESBL knowledge level was lower in nursing homes than in acute care settings. Fear and a lack of knowledge sometimes caused a lack of respect and empathy for ESBL-patients and residents. There was a lack of nurses and of single-rooms for ESBL-patients in acute care settings, resulting in staff being overworked and stressed, leading to guidelines sometimes not being followed.

In conclusion: To prevent the spread of ESBL-producing *Enterobacteriaceae* across borders and back home to Sweden there is a need for improved pre-travel advice for Swedish travelers. It is important with correct information to enable persons with ESBL to be able to cope with their everyday lives. Increased knowledge among staff is important to preserve the dignity of ESBL-patients in healthcare. It is also necessary to provide good working conditions for the staff so that they can give high quality care to patients and residents with ESBL.

Keywords: Extended-Spectrum Beta-lactamases, ESBL, antibiotic resistance, antibiotic-resistant bacteria, bacterial carrier, qualitative methods, Grounded theory, travel, prevention, staff experiences.

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LIST OF SCIENTIFIC PAPERS

This thesis is based on the following original papers, referred to in the text by the Roman numerals, I-IV:

I. Wiklund S, Fagerberg I, Örtqvist Å, Vading M, Giske CG, Broliden K, Tammelin A. **Knowledge and understanding of antibiotic resistance and the risk of becoming a carrier when travelling abroad: a qualitative study of Swedish travellers**. Scand J Public Health, 2015; 43: 302–308.

II. Wiklund S, Fagerberg I, Örtqvist Å, Broliden K., Tammelin A. **Acquisition of Extended Spectrum β-Lactamases (ESBL) during travel abroad – a qualitative study among Swedish travellers examining their knowledge, risk assessment and behavior**. Scand J Public Health, submitted.

III. Wiklund S, Hallberg U, Kahlmeter G, Tammelin A. **Living with extended-spectrum β-lactamase: a qualitative study of patient experiences**. Am J Inf Contr, 2013; 41:723-727.

IV. Wiklund S, Fagerberg I, Örtqvist Å, Broliden K, Tammelin A. **Staff experiences of caring for patients with ESBL-producing bacteria - a qualitative study**. Accepted for publication in Am J Inf Contr. E-pub ahead of print 17 August, 2015.

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LIST OF ABBREVIATIONS

AMR	Antimicrobial resistance
AN	Assistant Nurse
EPE	ESBL-producing *Enterobacteriaceae*
ESBL	Extended-Spectrum Beta-Lactamases
MRSA	Methicillin Resistant *Staphylococcus Aureus*
RN	Registered Nurse
PHA	Swedish Public Health Agency
STRAMA	Swedish Strategic Programme against Antibiotic Resistance

1 INTRODUCTION AND BACKGROUND

1.1 EXTENDED-SPECTRUM B-LACTAMASES (ESBL)

The discovery of the antimicrobial agent penicillin in 1928 by Alexander Fleming revolutionized the ability to treat bacterial infections (1). In his Nobel Prize speech in 1945, Alexander Fleming warned against bacteria becoming resistant to antimicrobial agents – it had already been discovered in laboratory tests – and he could already see the future of antibiotic misuse. The use and misuse of antibiotics since the 1940s have resulted in an increasing number of antibiotic resistant bacteria causing infections worldwide, and the impact of antibiotic treatment on the dissemination and persistence of resistant bacteria cannot be underestimated. Antimicrobial resistance (AMR) threatens both the effective prevention and treatment of infections caused by microorganisms. The ability to treat and prevent bacterial infection is critical to modern medicine, from orthopedic implants to organ transplants, from neonatal intensive care to cancer management. Without antibiotics, these procedures would be unthinkable owing to the risk of infection. AMR makes the treatment of patients difficult, costly, or even impossible. The impact on often vulnerable patients in healthcare is obvious, resulting in prolonged illness and increased mortality (2).

1.1.1 *Enterobacteriaceae*

Enterobacteriaceae is a large family of Gram-negative bacteria. Most of the Enterobacteriaceae are natural inhabitants of the intestinal flora in humans and animals, but can also be found in water, soil and other places in the environment. Some of them are human pathogens, of which *Escherichia coli (E. coli)* and *Klebsiella pneumoniae (K. pneumoniae)* are the most common.

E. coli and *K. pneumoniae* can cause common community-acquired infections, such as urinary tract infections, but also bloodstream infections, abdominal infections and pneumonia as well as healthcare-associated infections (3, 4).

1.1.2 Beta-lactam antibiotics and Beta-lactamases

Beta-lactam antibiotics include four main classes; penicillins, monobactams, cephalosporins and carbapenems, and they all share the β-lactam ring in their molecular structure. Beta-lactam antibiotics are often used to treat infections caused by *E.coli* and *K.pneumoniae*, including simple urinary tract infections, as well as severe life-threatening infections (3, 5).

B-lactamases were observed in bacterial strains of *E.coli* in the 1930s, prior to the release of penicillin as a therapy for bacterial infections (6-8). Penicillin became available for therapeutic use in 1940, but the ability of bacteria to produce enzymes that destroy the β-lactam antibiotics was already present when the drug was developed (6, 7, 9). The most common resistant mechanism among gram-negative bacteria against β-lactam antibiotics is the production of enzymes called beta-lactamase (β-lactamase). These enzymes inactivate the drug by hydrolyzing the β-lactam ring. The first time a β-lactamase-producing enzyme (TEM-1) in *E.coli* was described in a sample from a patient was in the early 1960s in Greece (10).

1.1.3 ESBL – Extended-Spectrum β-lactamases

As a result of therapeutic failure to penicillins and 1st generation-cephalosporins (introduced during the 1960s) the pharmaceutical companies introduced novel generations of cephalosporins in the late 1970s and early 1980s. These drugs had an expanded therapeutic spectrum and soon became commonly used all over the world for treatment of urinary tract infections, pneumonias and intra-abdominal infections caused by *Enterobacteriaceae*. These broad-spectrum cephalosporins remained a first-line defense against microbes for over 20 years. However, the extensive use of the broad-spectrum β-lactams resulted in the development of new enzymes with a wider range, the so called Extended-Spectrum Beta-lactamases – ESBL (11, 12). An ESBL-producing isolate of *Enterobacteriaceae* is resistant to later generations of cephalosporins but not to carbapenems. An infection caused by ESBL-producing intestinal bacteria, e.g. *E.coli*, is not more severe than an infection caused by *E.coli* not producing ESBL, but as the most common antibiotics are ineffective an adequate treatment can be delayed, or may even not exist (13).

Already today there is a huge number of different ESBLs, and new enzymes are still being discovered. The classification systems for beta lactamases in *Enterobacteriaceae* are the

Bush-Jacoby-Medeiros functional classification, the Ambler structural classification and the Giske classification. The Giske ESBL classification includes three classes; $ESBL_A$, $ESBL_M$ and $ESBL_{CARBA}$. $ESBL_A$ is the most common group and includes the dominating enzyme CTX-M (11, 14).

1.1.4 Prevalence of ESBL-producing *Enterobacteriaceae*

Short after the release of broad-spectrum cephalosporins for clinical use, at the beginning of the 1980s, the first findings of ESBLs were reported from Germany (15). The ESBL phenomenon began in Western Europe, most likely because expanded-spectrum β-lactam antibiotics were first used there clinically (16). It did not take long before ESBLs had been detected in the rest of the world. Since then ESBLs have gone from being an interesting scientific observation to a reality of great medical importance, and the issue has become a serious threat to public health. Infections with ESBL-producing *Enterobacteriaceae* can cause treatment failures, prolonged hospital stays, increased mortality and increased healthcare costs (13, 17). Nursing homes constitute a potential source of antibiotic-resistant bacteria because of the vulnerable, elderly people who live there, and the use of antibiotics is frequent. In a recent Dutch study, 33 (20.6%) of 160 residents in a nursing home were screened positive for ESBL carriage (18).

In Sweden the prevalence of ESBL-producing *Enterobacteriaceae* (EPE) is considered to be low compared with other countries. One factor contributing to this low prevalence could be Sweden's restricted antibiotic treatment policy, but despite this policy and decreasing antibiotic prescription to humans and use for domestic animals the numbers of EPE are increasing rapidly (19,20). Since 2007 there has been a national surveillance system for ESBL positive samples from humans, based on mandatory reporting from microbiological laboratories according to the law of notifiable diseases, and the number of cases have increased from 2009, in 2007 (Feb-Dec) to 8902, in 2014 (21). EPE is not only a problem for hospitals, nursing homes and healthcare settings, with the spread of healthcare associated infections, it has also become a social problem. Community-acquired infections, mainly urinary tract infections caused by *E. coli*, dominate among the reported cases of EPE. Outbreaks of healthcare associated infections caused by *K. pneumoniae* are reported from hospitals and nursing homes. A fecal carriage of EPE in a person without any symptoms does not require any treatment with antibiotics, but may predispose to a clinical infection. Asymptomatic fecal carriage among healthy individuals is increasing worldwide

(22) and in a recent Swedish study, among 2134 healthy individuals, 4.8% showed a positive sample for ESBL-producing *E.coli* (23).

In Europe, the prevalence of invasive infections caused by ESBL-producing bacteria (infections where the bacteria can be found in otherwise sterile locations, such as blood) differs between countries, but is increasing everywhere. It is more common in the eastern and southern parts of Europe compared with the northern countries. Yearly reports from a European network of national surveillance systems of antimicrobial resistance called EARS-net are available from the European Centre for Disease Prevention and Control (ECDC). Fig. 1 shows the levels of European invasive E.coli infections resistant to third-generation of cephalosporins in 2013 (24).

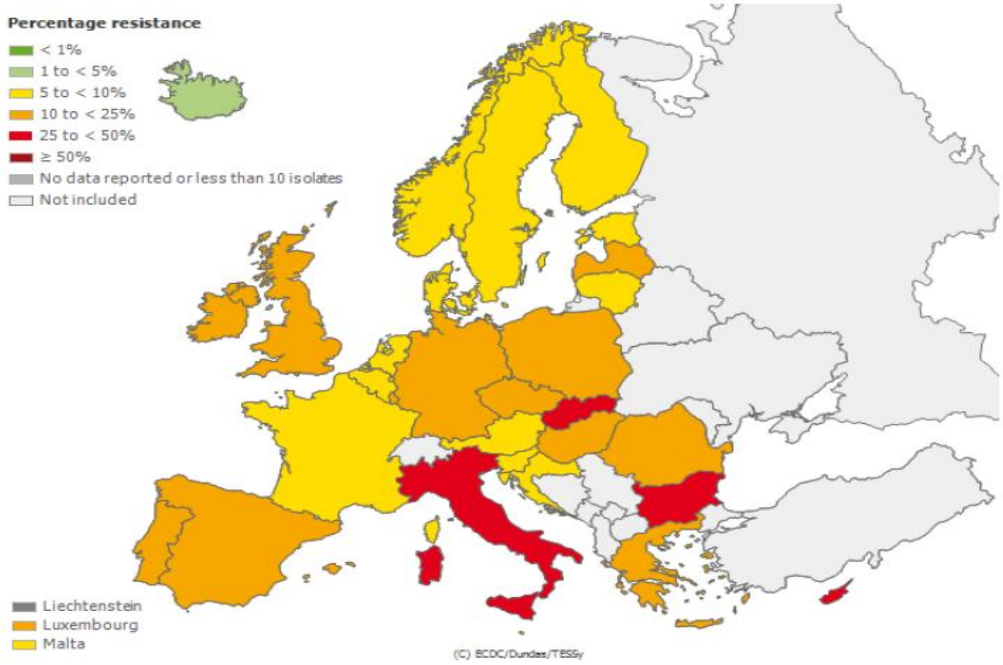

Fig. 1. Percentage of invasive *E.coli* isolates resistant to 3rd generation cephalosporins in 2013 from European Antimicrobial Resistance Surveillance Network (25). With permission of ECDC.

The prevalence of ESBL also varies in countries outside Europe, and high levels have been reported from other areas of the world. In an Indian study of 2568 patients hospitalized because of urinary tract infections, bloodstream infections or abscesses, 149 patients (21%) had an infection caused by *E. coli* and 69% of these isolates produced ESBL (26). Some studies have suggested that the ESBL-producing *E.coli* prevalence in India is equally as

high in the community as in the hospitals. The causes might be unregulated antibiotic use and an overloaded sewage infrastructure with recycling of gut bacteria (27).
Worldwide, the community carriage of EPE was almost 10% before 2008, but the numbers have increased in all countries since then (22). The Western Pacific, Eastern Mediterranean and Southeast Asia show the highest rates (Fig. 2). The number of estimated community carriers of EPE is over 1.1 billion in Southeast Asia, 280 million in Western Pacific area, 180 million for Eastern Mediterranean and 110 million for Africa (22).

As we travel across the borders the importance of asymptomatic fecal carriage of ESBL among healthy population will most likely increase even in low-prevalence countries, such as Sweden. In a study among 141 healthy volunteers in Thailand 51.8% were carriers of ESBL-producing *E.coli* (28) compared to 4.8% among 2134 healthy individuals in a recent Swedish study (23). There are probably many reasons why some countries have much a higher prevalence of EPE than others. In Europe some countries have restricted antibiotic prescription policies, while others have not, which influences prescription tradition, may enable buying over-the-counter antibiotics for self-medication, and thus shapes the overall pattern of antibiotic consumption (29). Emerging economies are often heavy users of antimicrobials in both medicine and agriculture, and have deficits in public health infrastructure, resulting in high rates of antibiotic resistance, especially Gram-negative bacteria (30).

Fig. 2 Number of ESBL carriers in the community in 2010, according to WHO regions grouping. The 6 WHO regions are represented by different colours (22). With permission from Clinical Microbiology Reviews.

1.2 HUMANS AS VECTORS FOR TRANSMISSION OF ESBL

1.2.1 Reservoirs and transmission of ESBL in the community

The transmission of ESBL-producing bacteria occurs fecal-orally (fecal bacteria from the stool of one human are swallowed by another human), usually from contaminated food or water sources due to lack of sanitation and hygiene (22). Reservoirs of ESBL could be human fecal carriers, food, animals and sewage sludge (27). New studies show the dissemination of ESBL between food, animals (food-production and pets) and humans. When the genes from gram-negative antibiotic resistant bacteria are spread in the community, there are opportunities for these bacteria to be more widely disseminated though the environment and a cyclical pattern could be established (Fig.3). The most substantial reservoir of ESBL-producing bacteria is the gut of man and animals, particularly if they have been given antibiotics. The contamination of water, food and the environment with EPE is a common way for transmission between man and animals. ESBL-producing bacteria are spread between people, food-producing animals, food and the environment (31-34), Fig.3.

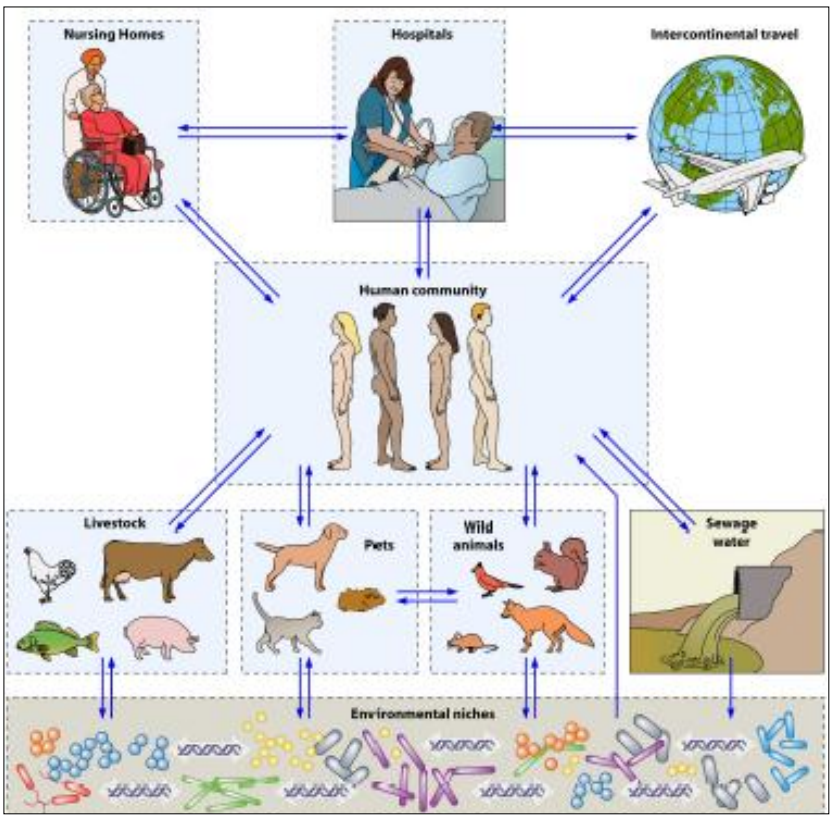

Fig. 3. The main digestive or environmental reservoirs of ESBL to which the worldwide human community belongs and is also exposed. Arrows show the flux of ESBL from one reservoir to another. Environment niches comprise mainly water, soils and plants (22). With permission from Clinical Microbiology Reviews.

River sediment could be a substantial reservoir of antibiotic- resistance genes (35). This could result in people who practice water sports or work with farm animals becoming carriers of ESBL (36). The role of polluted water as a reservoir for ESBL has been well documented, and this includes water for both drinking and food preparation. It is likely that the ESBL-producing bacteria often are acquired from food, for example vegetables and fruit washed in water contaminated with fecal bacteria (37). This is the situation in developing countries, with poor access to clean drinking water, poverty, high population density and high levels of antibiotic use.

Social conditions affect the development of antibiotic resistance through the use and misuse of antibiotics. The absence or awareness of the consequences of antibiotic misuse influences the behavior of the public, e.g. the frequency of self-medication with antibiotics (38, 39). Accordingly, a low awareness of the consequences of antibiotic resistance has been found in countries with high levels both of antibiotic misuse and of antibiotic resistance (40, 41). Travel to foreign countries with a high prevalence of ESBL-producing bacteria increases the risk of becoming a carrier of this type of bacteria (42, 43). The number of international tourists (overnight visitors) reached 1,138 million in 2014, 51 million more than in 2013. In 2014 the corresponding increase for international tourist arrivals in Asia and the Pacific was 13 million (+5%), up to 263 million (44). The tourist industry is one of the largest and fastest growing economic sectors worldwide and as a consequence of this travel-associated morbidity will continue to increase (45). The negative effect of travelers - tourists, business travel and refugees - as spreaders of antibiotic-resistant bacteria globally becomes obvious when people are travelling from areas with high prevalence of ESBL to countries with lower prevalence (34, 46).

Travel to high-prevalence countries probably contributes to the increased level of ESBL-producing bacteria in the Swedish community. Three Swedish studies have shown that 24-31% of persons travelling to such countries acquired ESBL-producing bacteria in fecal flora during their journey (47-49). Similar results are presented in a Swedish study by Angelin et al (2015) concerning 99 healthcare students travelling abroad for pre-clinical or clinical courses where 35% acquired a carriership of ESBL during their travel. The most important risk factor for ESBL was their travel destination, not the effect of being exposed to patient-related work, and the highest rates – 67% - of ESBL was found among students who traveled to South East Asia. (50). In another study of thirty-five Swedish students in exchange programs, twelve of eighteen (67%) visiting the Indian peninsula had a positive sample for ESBL-producing Eschericia coli after homecoming, while none visiting Africa showed a positive sample (51).

Since most carriers of EPE are asymptomatic they may unknowingly spread these bacteria to family members, within health care or their immediate environment, especially if they practice inadequate hand hygiene (42, 52). The increased level of carriers in the community increases the risk that other individuals will become carriers as a result of human-to-human transmission or through the environment. The admission of community carriers harboring ESBL to hospitals increases the risk of infection for other hospitalized patients (53).

A new type of traveler that is becoming common is the "medical tourist". Patients travel internationally for various procedures, such as cosmetic surgery, fertility treatment or an organ transplant. The treatment centers are often located in countries with a high rate of antibiotic-resistant bacteria such as India, Thailand, China, Mexico and the Middle East (54). These patients may both be victims and vectors of healthcare-associated infections of antibiotic-resistant bacteria (55, 56). The same risk applies to military personnel or civilians transferred from conflicts of war to specialist units in their home country for treatment. Such conflicts often occurs in poorer regions of the world, with a lack of basic healthcare, resulting in patients possibly being at risk for many infectious diseases, including antibiotic- resistant bacteria such as ESBL (57).

1.2.2 Healthcare associated infections and outbreaks caused by ESBL

Antibiotic use is a frequently reported risk factor for carriership or infection with ESBL-producing *Enterobacteriaceae* in healthcare settings. Other reported risk factors are severe illness, prolonged hospital stay, nursing home attendance, hemodialysis, invasive medical devices and recent surgery (58). Advanced age and dementia can also be significant risk factors for infections caused by resistant bacteria (59-62). Infections caused by ESBL-producing bacteria in healthcare settings have several consequences, including antibiotic treatment failures, increased mortality, and an increase in the cost of public health (63).

The increasing prevalence of asymptomatic fecal carriage of ESBL in the community also has important implications for the healthcare setting (64, 65). ESBL-producing bacteria are now a problem in hospitalized patients worldwide (16). Fecal carriage of ESBL-producing bacteria in both patients and non-hospitalized persons has been reported as increasing the risk of the spread of healthcare associated infections and poses a serious threat to public health (53, 66). In low-prevalence countries, like for example Sweden, infection control measures in healthcare settings mainly focus on patients who have been hospitalized while abroad, fearing that they may spread antibiotic-resistant bacteria. Thus, there is a risk of asymptomatic

carriers unknowingly spreading EPE to the environment or other humans in healthcare settings and nursing homes, especially if inadequate hand hygiene is involved, and if hygiene routines are not applied by the staff. This may explain why outbreaks of ESBL in a healthcare setting can become extensive before being recognized (67, 68). It is also possible for the healthcare staff to be carriers of ESBL, knowingly or unknowingly, and they may also risk spreading the contagion if adequate hygiene routines are not applied (69).

The transmission route for ESBL-producing bacteria is above all fecal-oral and poor adherence to hand hygiene practices increases the risk of spreading such bacteria. Patient-to-patient transmission is possible through toilets, shower rooms, food buffets and patients helping each other (68, 70). Healthcare staff can spread ESBL between patients and residents through inadequate hand hygiene, clothes and other poor hygiene routines, but also through contaminated surfaces in the environment, contaminated food and equipment, such as contaminated boxes of gloves, endoscopes, food buffets, breast pumps and breast milk storage bottles (62, 69, 71-73).

Deficiencies in infection control measures and hygiene routines have caused a large number of hospital outbreaks of ESBL-producing *Klebsiella pneumonia*, mainly in neonatal units and intensive care units where the consumption of antibiotics is high and where patients are severely ill (69, 74). Understaffing and overcrowding of patients have repeatedly been described as risk factors for increased infection rates and the occurrence of outbreaks of ESBL. Outbreaks have also been related to frequent transfers of ESBL-patients between units of the hospital due to a shortage of beds (68, 75). The first major outbreak of ESBL-producing *Klebsiella pneumoniae* in Northern Europe took place at the University Hospital of Uppsala, Sweden, between May 2005 and August 2007, where 247 mainly older patients were affected in more than 30 wards (68, 76).

1.2.3 Knowledge, risk assessment and risk behavior concerning ESBL

There is no commonly accepted definition for the term risk, and all risk concepts have one element in common, the distinction between reality and possibility. The term risk could be defined as the possibility that human actions or events lead to consequences that have an impact on what human value (77). The term risk could be described as something that could be a danger. Although the concept of risk could also stand for something that can be developed into something positive, the term mainly seems to be linked to something negative. A risk could refer to something undesirable or unpleasant, or involve something unfortunate

that may happen. As a result the risk could cause uncertainty and signal a possible future danger, damage or loss. The concept of risk could also be associated with responsibility. The responsibility aspect suggests that the risk may not be attached to anything random, or something that the person falls victim to, but could point to the responsibilities and obligations that require action (78).

Lack of knowledge, poor risk assessment and risk behavior among members of the public contribute to the spread and development of antibiotic resistant bacteria. Antibiotic resistance is strongly associated with improper usage of antibiotics. Here, the behavior of the public is influenced by whether or not they are aware of the consequences of antibiotic misuse (38, 39).

There have been studies which have examined the public's attitudes and knowledge concerning the use of antibiotics and antibiotic resistance in general, but to the best of my knowledge there are no studies regarding the public's knowledge about ESBL-producing bacteria. Some studies have reported ignorance about antibiotic resistance among study participants (79, 80). There was uncertainty about the causes and consequences of antibiotic resistance, and they did not believe that it was a personal threat to them or a problem for the community. Antibiotic resistance was considered to be a problem for hospitals, and not thought to affect people outside the hospitals. The threat to them personally was considered low, and they felt that they contributed to neither the cause nor the solution of the problem. In those studies, as well as in a study of Brooks et al (2008) the participants distanced themselves from the problem (81). In seeking to explain the causes of antibiotic resistance, blame was primarily attributed to other patients who used antibiotics "irresponsibly", physicians who had overprescribed antibiotics and poor hospital hygiene. Another study reports that there may be a missing link between the participants concern at a global level and at an individual level (82). Individual behavior and use of antibiotics were not seen as causing a problem for society as a whole. Most of the participants were not concerned about their individual antibiotic use, and would take antibiotics "when necessary".

A Swedish study showed that knowledge among the study participants of when antibiotics should be used was fairly good, but that confusion persisted regarding antibiotic resistance, so that people even believed that it was humans, rather than bacteria, who could become resistant to antibiotics (83). Despite a lack of knowledge, some people are concerned about antibiotic use and the increase of antibiotic resistance. They think that this will upset the

body´s balance in some way and they are using different strategies to try to prevent and treat infections without antibiotics. They believe that it is better to strengthen the body to resist infection than to treat it (84).

Social and cultural views concerning infectious conditions differ between populations, which might influence the use of antibiotics. Demand for antibiotics from the public is often perceived as high even for conditions without a clinical indication for antibiotic treatment, but studies have shown that this demand is overestimated by the prescriber, and antibiotics could therefore successfully be replaced by better information and follow-up (85, 86). One of the countries with the highest prevalence of ESBL and a high consumption of antibiotics is India. In a study by Chandy et al (2013) among Indian doctors, pharmacists and the public it was found that people in the community had minimal awareness of antibiotic resistance, antibiotics and infections. There was also a strong culture of self-medication and antibiotics could be bought directly "over the counter" from pharmacy shops. Besides the individual risk of self-medication, this behavior contributes to increasing antibiotic resistance in the community (41). A study from Hong Kong showed that a lower education level, family income and the male gender were identified as predictors of inappropriate behavior for antibiotic use (87).

Travel to foreign countries poses a possible risk for acquiring ESBL-producing bacteria, especially where there is a high prevalence of EPE. There are no studies regarding travelers´ knowledge, risk assessment and risk behavior concerning ESBL during travel to foreign countries, but there are studies of risk assessment and behavior related to other communicable diseases. Studies about risk assessment among travelers show that they are not fully aware of the health hazards during their journey and do not always take appropriate safety precautions (88, 89). You may question why travelers expose themselves to risk. One explanation could be that they do not feel that they are exposed to risk, or that they are unaware that their situation is unsafe. Different kinds of travelers are exposed to different kinds of risk. In addition, it seems that people perceive and approach health risks differently when visiting relatives and friends compared with when they are on business trips (90, 91). Holiday travelers are more often exposed to risks when "letting it go", showing more willingness to look for experiences and take health care risks. This increases the risk of infectious diseases, including an acquisition of antibiotic resistant bacteria such as ESBL (92, 93). In a study by Wynberg et al (2013), investigating the risk perception for the acquisition of infectious diseases in the destination country of 698 travelers, an underestimation of the risk was 23%

more common than overestimation. A low risk awareness may lead to reduced precautionary behavior (94). A pre-travel risk assessment should include the risks prevalent at the destination, mode of travel, the traveler´s medical history and available preventive measures (95). As it is likely that the ESBL-producing bacteria will often be acquired through food or water, for example from vegetables and fruit washed in water contaminated with fecal bacteria, it is important that adequate pre-travel information is given about preventive measures. Hand washing is both important and necessary to prevent carriership of fecally/orally transmitted infections such as ESBL (32, 37).

1.3 HUMAN PERSPECTIVE ON ESBL

1.3.1 People who become carriers of antibiotic-resistant bacteria

Being a carrier of an antibiotic-resistant bacterium can be emotionally stressful for the individual, and affect daily life. There are no scientific studies regarding the personal experience of becoming a carrier of ESBL-producing bacteria, but there are studies concerning the carriership of another antibiotic-resistant bacteria - MRSA *(*Methicillin-Resistant *Staphylococcus Aureus).*

In order to manage their lives, it is vital that new carriers of antibiotic-resistant bacteria receive adequate information from the physician in charge when the carriership is diagnosed. The Swedish Patient Safety Act (SFS 2010: 659) requires health and medical care staff to provide patients with "personalized information". This means that the information should be conveyed bearing in mind each individual patient's circumstances and ability to receive and absorb information. It should be tailored to the individual patient's individual needs and therefore will be varied in both content and design. This means that as far as possible one should adapt the language, the media and the approach to each patient's state of health, maturity and experience, cognitive ability, possible disability, and cultural and linguistic background. Linked to this are various forms of feedback and monitoring of whether and, if so, how the patient understands the information given (96). It has been reported that in the broader perspective the media acts as a conduit between medical science and the public and thus is the main source for public information about resistant bacteria, with the television and newspapers being the most common source of information. This illustrates the importance of the correctness of the content of this type of information (82, 97).

In a study by Newton et al (2001), nineteen individuals with newly diagnosed MRSA were interviewed about their experiences. The majority of the participants did not have a clear understanding of MRSA, nor did they understand the purpose of the hygiene routines of healthcare staff. This was despite them all having received verbal and written information about MRSA. The origin of the carriership was attributed to hospitalization, to low immunity in individuals, to bad luck or was unknown. Some were angry, blaming the hospital for the acquisition of MRSA (98). Similar results were presented in a Swedish study among fifteen participants with MRSA. There were various emotional reactions upon being told of the MRSA diagnosis, from indifference to shock, and the level of understanding after the information had been given varied. Some participants expressed feelings of shame, disgust and fears that they might be a threat to other people. Fear of infecting others was a concern for the majority of the participants (99).

When carriers of antibiotic-resistant bacteria occasionally need medical care in acute care settings and become patients, there is a risk of victimization and stigmatization from health care workers. There are descriptions of patients experiencing health workers as ignorant and disrespectful (100). When hospitalization is needed for MRSA patients they are often isolated in single rooms. This isolation can be a stress factor for the patients, with the experience of being imprisoned and alone. It has also been reported that isolated patients receive fewer visits from staff than patients cared for in non-isolation rooms, with the attendant risk of receiving a lower quality of care. Sometimes patients do not know the reason for the isolation, and why staff use safety equipment (101, 102).

1.3.2 Healthcare staff caring for persons with antibiotic-resistant bacteria ESBL

Caring for patients and residents with antibiotic-resistant bacteria ESBL is a major challenge for healthcare staff. There is a risk of spreading of the contagion between patients and residents, and being infected themselves (101, 103, 104). As patients sometimes feel stigmatized and treated in a disrespectful way it is important to try to search for the underlying causes for this and to explore the situation for healthcare staff caring for persons with ESBL-producing bacteria. To the best of my knowledge there are no studies looking exclusively at the experience of staff caring for ESBL patients or residents, but there are studies looking at the experience of caring for persons with various antibiotic-resistant bacteria and other infectious diseases in acute care settings, primary healthcare and nursing homes (100-102, 104). Fear among staff, primarily a fear of becoming infected themselves or

passing the contagion to their families, could affect their willingness to care for these patients. They may fear that if they become infected they could lose their jobs and therefore their income (100, 102, 105-108). It has also been shown that a lack of knowledge can cause fear and lead to poor compliance with correct procedures, e.g. the excessive use of protective clothing (62, 100, 109, 110). Lack of knowledge of the correct hygiene routines and antibiotic resistant bacteria may also affect compliance to guidelines. Thus, it is important to know that by increasing the level of staff knowledge it is possible to reduce fear, and to increase the readiness of staff to care for patients with infectious diseases (111-113).

The common route for transmission of antibiotic-resistant bacteria in health care is via contaminated hands, gloves, clothes, equipment and the environment (72, 73). To prevent nosocomial infections the Standard precautions method must be applied in Sweden for all patients/residents in all types of care. The National Board of Health and Welfare Regulations on Basic Hygiene for Swedish Health Services (SOSFS 2007:19) specify the procedures that are to be integrated into work routines for all caregivers during the examination, care and treatments of patients, or other direct contact with patients;

National Board of Health and Welfare Regulations on Basic Hygiene for Swedish Health Services (SOSFS 2007:19)

- Working-clothes shall have short sleeves
- Working-clothes shall be changed daily, or more often when needed
- Hands and lower arms shall be free from wristwatches and jewellery
- Hands shall be disinfected using an alcohol-based hand disinfectant, or another product with similar effect, immediately before and after each direct contact with a patient
- Hands shall be disinfected before and after using gloves
- If hands are visibly soiled, they shall be washed with water and liquid soap before being disinfected
- When caring for a patient with gastroenteritis, hands shall always be washed with water and liquid soap before being disinfected
- A disposable plastic apron or protective gown shall be used if there is a risk that working-clothes will come into contact with body fluids or other biological substances
- Disposable protective gloves shall be used if there is a contact with, or risk of contact with, body fluids or other biological substances
- The protective gloves shall be removed directly after that stage of work is finished, and shall be changed between stages of work

(114, 115)

Although this regulation is legally compulsory, compliance is not optimal mainly due to a lack of knowledge or a lack of time among healthcare professionals (111, 112). A study by Seibert et al (2014) reported that health care staff felt responsible for preventing transmission of antibiotic-resistant bacteria, and had the knowledge and desire to do so, but that there were barriers for compliance with hygiene routines such as insufficient access to protective equipment, lack of sinks, high workloads and time pressure. Thus, they had the necessary knowledge of guidelines and other current routines, but sometimes lacked the ability to translate that knowledge into practice (110). Failure to comply with hygiene routines because of overcrowding or understaffing may in turn lead to an increased risk of spreading infection, and a lower level of patient safety (75, 101, 116). Time constraints and the effort required to put on protective clothing for every visit may also lead to patients in isolation receive fewer visits from staff (98, 100, 101).

2 AIMS OF THE THESIS

2.1 OVERALL AIMS

The overall aim of this thesis was to explore how the increasing prevalence of ESBL-producing intestinal bacteria both globally and in Sweden affects different groups among the Swedish population. The knowledge about antibiotic resistance and risk assessment among travelers, the experiences among carriers of ESBL-producing bacteria and the experiences among healthcare personnel caring for patients and residents with ESBL-producing bacteria.

2.2 SPECIFIC AIMS

I. To describe the knowledge and understanding of antibiotic-resistant bacteria, and of the risk of becoming a carrier of such bacteria, among Swedish travelers before travel to high-risk areas.

II. To learn about knowledge of antibiotic resistance, behaviour and risk-taking among travelers, who acquired carriage of ESBL-producing bacteria during a trip to a high-prevalence country.

III. To increase the understanding of how infected individuals perceive their situation as "carriers" of ESBL-producing bacteria.

IV. To increase the knowledge of what it means for staff in acute care settings and in nursing homes to care for patients with ESBL-producing intestinal bacteria.

3 METHODS AND DESIGN

3.1 GROUNDED THEORY

3.1.1. Pragmatism and symbolic interactionism

Grounded Theory (GT) is a research method that has its philosophical roots in American pragmatism and its theoretical resident of symbolic interactionism. Pragmatism is a direction in philosophy that emerged in the United States around the turn of the last century. Pragmatism believes that Man is trying to solve situations by acting, that humans are a part of the world and acquire skills as participants and not as spectators, and that the human experience is the basis for all knowledge (117-119). Symbolic interactionism is derived from pragmatism ideas, and Blumer (1969) in particular developed the idea that we create our reality in dialogue with others, that people's actions can be understood from the sense objects or phenomena have for them. People act toward things based on the meaning those things have for them and these meanings are derived from social interaction and modified through personal interpretation (117, 118, 120, 121). Pragmatism and symbolic interactionism came to characterize the school of thought developed by the so-called School of Chicago in sociology in the early 1900s. The school of Chicago had an important role in the development of the sociology and the development of Grounded Theory (117, 122).

3.1.2 The development of Grounded Theory

Grounded Theory was developed in the Chicago school between 1920-1967 by Barney Glaser and Anselm Strauss. The theory was created as a counterweight to the biological and quantitative approach. Together they tried to find a method to create the theory of the meaning people attribute their reality. The approach can be described as theory generation with an empirical foundation. Based on practical experience conceptual and theoretical models are created, which are then reformulated and revised as new knowledge emerges. Grounded Theory is particularly suitable for studying the areas where theories exist or are scarce, to gain a new perspective on a known area and for studying social processes (119, 122, 123). After Glaser and Strauss presented Grounded Theory, 1967, the method was developed in a number of different directions.

3.1.2.1 Classic GT - Glaser & Strauss

The classic grounded theory assumes that reality is objective and can be studied (positivistic approach). The method aims to generate theories of human behavior, and have a clear framework for data collection, analysis and the writing of the results. The result emerges from the data, there is nothing that the researcher can influence. The researcher exposes him/herself to the research field, and tape recording is not required. It is critical of pre-understanding (preconception), research should be unprejudiced and "free from theory". Any negative influence of preconceived notions and existing theories on the outcome should be minimized. Literature studies should therefore be avoided prior to research. The result can be a hypothesis to be tested further, quantitatively or qualitatively (124).

3.1.2.2 Modified GT – Corbin & Strauss

The reality is still objective, but it is the informant's view of reality which the researcher interprets (reality can be interpreted in different ways). The aim is to study social processes. It uses open axial and selective coding, as well as a coding paradigm for systematization of data. Axial coding relates categories to subcategories and specifies the dimensions and properties of a category. Axial coding answers the questions “when, where, why, how and with what consequences”. Based on these categories a theory can then be generated that will have practical value (117).

3.1.2.3 Constructivist GT - Charmaz

Charmaz assumes that there are as many realities as there are individuals. This approach tries to describe a reality, not objective truth. The researcher interprets the informant's reality, and the result emerges in an interaction between the researcher and participant. Charmaz suggests that the researcher should conduct repeated interviews with an informant to gain understanding. The result is presented more as a story with an understanding of the phenomenon than as a theory; sense-action, action-sense (122, 125).

The purpose of Grounded Theory is either to modify an existing theory in the light of new data or to generate a new theory from data. One of the basic principles of the method, irrespective of version, includes constant comparisons, theoretical sampling and saturation. One piece of data is constantly compared with other pieces, looking at similarities and differences. Interviews are often used for collecting data, including collection of memos, and

after transcribing the text the analysis process begins (122). Open coding involves line-by-line reading and asking questions of the data of what the text was about. Closely related codes are formed into preliminary categories, and codes are related to each other and clustered into summarized categories at a higher abstract level. Saturation is reached when new data fits into the categories, and no new data seems to be emerging (122). The idea of saturation of categories is important in Grounded Theory, but some authors argue that categories may never be saturated (125). Finally, it should be possible to identify a core category, describing what the study is about, which can then be related to the additional categories (117, 119, 124, 126). However, there are different interpretations of the method among researchers worldwide (127).

3.1.2.4 Modified version of Grounded Theory according to Corbin & Strauss

Due to the lack of studies exploring peoples´ knowledge, risk assessment and emotional impact of a carriership of ESBL a qualitative method was selected. In the research area of human behavior this qualitative method can help us to improve our understanding of areas where we have little or no knowledge. When choosing research methods for the present thesis Grounded Theory, aiming at studying social processes and interactions between people, was regarded as a suitable method for **Paper II, III** and **IV**. A modified version according to Corbin & Strauss was selected for these studies.

3.2 CONTENT ANALYSIS

In **Paper I** content analysis according to Graneheim & Lundman (2004) was used for the analysis. Content analysis was developed to handle large amounts of data and two specializations are available; a quantitative branch, which is mainly used for quantifying data with frequencies and proportions, and a qualitative branch that is used for the interpretation of texts (128, 129). In its early stage in the 1950s, the method was often used for quantitative descriptions of a subject. Nowadays content analysis is also used in qualitative research, and includes various levels of interpretation. Interviews, focus groups and questionnaires are methods used for data collection. A manifest or a latent approach can be adopted. Both manifest and latent content analysis deal with interpretation – there is always a degree of interpretation in qualitative content analysis according to Graneheim and Lundman - but the

interpretation varies in depth and level of abstraction (128). The manifest content is the obvious, the visible content – the surface structure present in the message. The latent content deals with the underlying meaning, with interpretation requiring a higher abstraction level (128, 130, 131).

The central processes in qualitative content analysis create meaning units, condensed meaning units, codes, subcategories, categories and finally a theme. After transcribing the data collected, and listening to and reading all the text several times, meaning units are identified, comprising sentences or words associated with its content. The meaning units are condensed to shorten the text, preserving the entire content. The different meaning units are then codified and abstracted into subcategories and categories. Finally a theme is created, answering the question "how?" reflecting the contents of the underlying categories (128, 132).

3.3 DESIGN

This thesis consists of four empirical studies (Paper I-IV, Table I). **Paper I** has a descriptive design. **Papers II, III and IV** employs an exploratory design using qualitative data.

Table I. An overview of methods in Paper I-IV

Study	**Paper I**	**Paper II**	**Paper III**	**Paper IV**
Aim	To describe the knowledge and understanding of antibiotic-resistant bacteria, and of the risk for becoming a carrier of such bacteria, among Swedish travelers before travel to high-risk areas.	To learn about knowledge of antibiotic resistance, behaviour and risk-taking among travelers, who acquired carriage of ESBL-producing bacteria during a trip to a high-prevalence country.	To increase the understanding of how infected individuals perceive their situation as "carriers" of ESBL-producing bacteria.	To increase the knowledge of what it means for staff in acute care settings and in nursing homes to care for patients with ESBL-producing intestinal bacteria.
Method/Design	Qualitative descriptive study	Qualitative exploratory study	Qualitative exploratory study	Qualitative exploratory study
Data sources	95 travelers	15 travelers with ESBL	7 patients with ESBL	23 staff members; 10 ANs 10 RNs 3 Physicians
Data collection	Questionnaire	Qualitative interviews	Qualitative interviews	Qualitative interviews
Data analysis	Qualitative Content Analysis	Qualitative Grounded Theory	Qualitative Grounded Theory	Qualitative Grounded Theory
Status	Published	Submitted	Published	Published

Paper I: Qualitative descriptive study

Design and data collection

With the aim of describing the knowledge and understanding of antibiotic-resistant bacteria, and the risk of becoming a carrier when abroad, a prospective study was performed among

Swedish travelers. The participants were recruited in collaboration with a clinic for travel medicine and vaccinations in Stockholm where many travelers go for vaccinations and advice prior to travel. During May-December 2013, persons who planned to travel to India or neighboring countries, South East Asia, North Africa or the Middle East were asked to participate in the study. A questionnaire with three open-ended questions was distributed in the vaccination clinic to one hundred travelers who had agreed to participate. The questions were: "Tell us what you know about antibiotic-resistant bacteria.", "How do you perceive the risk of contracting antibiotic-resistant bacteria during your journey?", and "In what way can you avoid becoming a carrier of antibiotic- resistant bacteria during your journey?" The travelers answered the questionnaires at home and returned them with a signed informed consent to the research team by ordinary mail. Participants´ integrity and autonomy was ensured through confidentiality and voluntary participation. Five out of the hundred persons who agreed to participate in the study did not return the questionnaire.

Participants

The study group consisted of sixty-three women (mean age 48 years, range 19-73) and thirty-two men (mean age 44 years, range 20-77). There were forty-three travelers going to South East Asia, thirty-five to India with neighbouring countries, nine were going to North Africa and eight to the Middle East.

Data analysis

The answers were transferred into typewritten text in tables, containing thirteen pages. The researcher read the text several times to obtain an overall impression. The text was analysed using qualitative content analysis according to Graneheim & Lundman (128). As most answers were brief this method was suitable for the purpose. The analysis process included creating meaning units, condensed meaning units, codes, subcategories, categories and finally a theme. The researcher and one of the co-authors, who had also read all typewritten text, discussed the included moments in the analysis until agreement was reached. Finally a theme was formulated which summarized the underlying content.

Paper II: Qualitative exploratory study

Design and data collection

The aim of this study was to learn about people's knowledge of antibiotic resistance, their behavior and risk-taking among travelers, who had become carriers of ESBL-producing bacteria during trips to high-prevalence countries. This was a retrospective study among

Swedish travelers. The participants were recruited in collaboration with the same clinic for travel medicine and vaccinations in Stockholm as in Paper I. During the period May-December 2013 people who planned to travel to the same areas as in Paper I were asked to participate in another study where a sample for ESBL was taken before and after travel. In a questionnaire the travelers were asked if they were willing to participate in an interview after their trip if the sample was found to be positive for ESBL when they returned. The first twenty-six travelers who accepted the request and were diagnosed with a new ESBL positive test result were then contacted by the research team asking if they still agreed to participate. Written information with informed consent was delivered to their homes by ordinary mail. A reminder was sent out to those who did not respond. Fifteen of the 26 ESBL-positive persons agreed to be interviewed and were included in the study. An open-ended, audio-taped interview, lasting up to sixty minutes, was conducted with each of the participants. The location of the interview was chosen by the participants. An interview guide with two open-ended questions was used; "During your trip abroad you have become a carrier of intestinal bacteria that are resistant to antibiotics and I wonder if you could tell me about your trip - what you experienced and what are your thoughts now that you have a carriage of resistant intestinal bacteria after the trip? Do you think that you exposed yourself to the risks of acquiring a carriership during the trip?" In addition to these questions, the participants were free to tell about all their experiences during their journey and had the opportunity to raise questions of relevance to them. The interviews were transcribed verbatim, and memos such as emotional expressions and longer breaks were added to the text.

Participants

The study group consisted of twelve women (mean age 52 years, range 35-69) and three men (mean age 52 years, range 29-67). Four had traveled to South East Asia, ten to India or neighbouring countries and one to North Africa.

Data analysis

As this is a research area where there is no previous knowledge Grounded Theory was selected as an appropriate method. A modified version according to Strauss & Corbin (117) was used for the analysis with the aim of studying social processes and interactions between people. The texts were read several times in order to gain an overview of the content, and to identify similarities and differences. Open, axial and selective coding processes were used and also a coding paradigm of "cause and effect". This led to the development of subcategories, categories and finally a "core category", describing what the study was all about and reflecting the contents of the underlying categories. The researcher and one of the

co-authors, who also had read all typewritten text, discussed the included moments in the analysis until agreement was reached.

Paper III: Qualitative exploratory study

Design and data collection

The aim of this study was to increase the understanding of how individuals who have become carriers of ESBL perceive their situation and of the consequences it brings to their daily life.

The study was conducted in collaboration with a laboratory at a hospital in Stockholm County. The instructions to the laboratory were given both orally and in writing. When a new microbiological culture resulted in a positive sample for ESBL a letter from the research team was distributed from the laboratory to the physician who prescribed the test. The laboratory was instructed, for an agreed number of events (discovery of the bacterial production of ESBL in patients over 18 years who had not previously been offered participation in the study) to send a letter with a paper copy of the culture results to the responsible physician. In the envelope were two cover letters; one letter to the physician which described the purpose of the study, practice and a request to hand over the second letter to the patient if the doctor found it appropriate according to his/her knowledge about the patient. The physician was asked not to remind the patient according to the decision of the ethics committee.

The letter to the patient, containing a stamped reply envelope, described briefly the study's purpose, approach and inquired if the person wanted to participate in a tape recorded interview. The letter also included an informed consent form, which was to be signed by both the interviewer and the informant before an interview. Patients who did not respond or declined to participate in the interview were not asked again. If the patient was willing to participate, he/she contacted the interviewer to book a time for interview. The laboratory was asked to list how many envelopes were sent out, as well as the gender and year of birth of the patients. In this way, the number who did not take part in the study could be calculated as well as the gender and age distribution of the study. Seventy envelopes were sent out between 2010-01-27 and 2010-04-09. Seven persons were interested in participating and were called for an interview. An open-ended, audio-taped interview, lasting up to 60 minutes, was conducted with each participant. The location of the interview was chosen by the participants. Six participants wanted the researcher to visit their homes, and one visited the researcher´s office. An interview guide was used and covered themes such as personal reflections on having the diagnosis, consequences for their daily life and experiences of treatment by both

professionals and family. The participants had the opportunity to raise questions of relevance to them. The interviews were transcribed verbatim, including memo writing.

Participants

The study group consisted of seven participants diagnosed with ESBL (three men and four women, mean age 68 years, range 41-80 years) all living in central Sweden.

Data analysis

The research question determines what kind of research method should be used. In this study the research questions concerned the social processes that are initiated once an ESBL diagnosis has been confirmed. The constant, comparative method of modified Grounded Theory is especially suitable for studying social processes and was therefore chosen as the method for collecting and analysing the data (117). We used a modified version according to Corbin & Strauss (117) with open axial and selective coding, as well as a coding paradigm for systematization of data. In this study a coding paradigm was used with a process perspective of cause and effect in time that led to consequences and strategies for the individual. The results presented the participants' experiences of being a carrier of ESBL and the consequences in their daily life, from which the preliminary categories employing a time/process perspective were drafted. The researcher and one of the co-authors, who had also read all typewritten text, discussed the included moments until agreement was reached. In the analysis process a core category was identified, describing what the study was all about, which could be related to the additional categories.

Paper IV: Qualitative exploratory study

Design and data collection

The purpose of this study was to increase the knowledge of what it means for staff in acute care settings and nursing homes in Stockholm County to care for patients with ESBL-producing intestinal bacteria. The inclusion criterion for participating units in acute care settings was that they should have cared for > 12 ESBL patients as in-patients during the year 2013. In nursing homes the criterion was having at least one resident with ESBL during the year 2013. The Stockholm County Council database for multi-resistant bacteria was used to identify these units.

In acute care settings 140 units in 15 hospitals fulfilled the inclusion criterion. A written request was sent to the head of each department (a department could include one or more

units) asking them if they were willing to participate. Seventy-four units did not reply, but sixty-six units were interested in participating. With the Head of Department's permission the unit managers/chief nurses were contacted by telephone, which resulted in ten Registered Nurses (RNs) and five Assistant Nurses (ANs) volunteering to participate. Since no physicians expressed interest in participating, a reminder was sent out to which three physicians from two other units responded positively. As the number of voluntary participants in the acute care settings group exceeded requirement in the RN and AN groups, a selection was made to include participants from as many different specialties as possible.

Forty-nine nursing homes fulfilled the inclusion criterion. The same procedure as for acute care settings was used. Five RNs and five ANs from ten nursing homes, located in Stockholm County, agreed to participate. A semi-structured, open-ended, audio-taped interview, lasting up to sixty minutes was conducted with each participant by one of the authors (SW). An interview guide was used and most participants chose to be interviewed at their place of work. In addition, participants had the opportunity to raise questions and the interviewer asked follow-up questions to ensure that she had understood the participants. The interviews were transcribed verbatim, including the writing of memos.

Participants

The final study group thus totalled twenty-three persons. Five ANs, five RNs and three physicians working in acute care settings and five ANs and five RNs working in nursing homes in Stockholm County.

Data analysis

For the data analysis a modified version of Grounded Theory according to Corbin & Strauss (2008) was used. In this study we wanted to increase our knowledge of the social processes and interactions between people in the caring of ESBL patients and residents, and for this Grounded Theory was a suitable method (119, 122). The interviews were read several times in order to identify similarities and differences, and they were then divided into two groups; acute care settings and nursing homes. This was done because the context differs between these areas of care. Initially there was an open coding process with line-by-line reading followed by asking questions of the data of what the text was about. Closely related codes were formed into preliminary categories, and in the axial coding process these codes were related to each other and clustered into summarized categories at a higher abstract level, using a coding paradigm of "cause and effect". The present situation resulted in different consequences and strategies for the individual. The researcher and one of the co-authors, who had also read all typewritten text, discussed the included moments in the analysis until

agreement was reached. Finally, a core category was identified, describing what the study was about, which could then be related to the additional categories. In this study one core category was identified for each group.

3.4 ETHICAL CONSIDERATIONS

According to the Swedish Research Council it is the researcher´s responsibility to ensure that the research is of good quality and morally acceptable (133). All studies included in this thesis were conducted in accordance with the Helsinki Declaration (134) and the International Council of Nurses Codes of Ethics for Nurses (135).

The studies in **Paper I, II** and **IV** were approved by The Regional Ethical Review Board in Stockholm, Sweden. The study in **Paper III** has an approval from The Regional Ethical Review Board in Gothenburg, Sweden. Participants in a research study are always in a vulnerable position, the study could make them feel exposed. Sensitivity is always involved when someone else wants to know how they think and feel about their work and personal lives. One can see it as a specific infringement of privacy. All participants in the studies included in this thesis were ensured integrity, including both confidentiality and voluntary participation. Anyone could withdraw their participation from the studies at any time without any consequences. Information was given both orally and in writing, and all signed a written informed consent. Written agreement was obtained from the Editorial Offices for the publication of articles included in this thesis.

4 RESULTS

The studies focused on different perspectives of the phenomenon Extended-Spectrum Beta lactamases (ESBL) depending on the context of the study participants. Some views are those of public citizens and others those of staff and patients in healthcare and nursing homes.

4.1 KNOWLEDGE, RISK ASSESSMENT AND RISK BEHAVIOR AMONG TRAVELERS

In **Paper I** and **Paper II** the results are presented from studies focusing on Swedish travelers before departure and after homecoming from travels to high-prevalence countries for ESBL.

The aim of **Paper I** was to describe the knowledge and understanding of antibiotic- resistant bacteria among travelers before departure, and in addition their risk assessment of the chance of acquisition of such bacteria during the trip. The analysis resulted in the theme *To be an insecure traveler who takes control over their own journey*. The results showed that travelers lacked knowledge and understanding of the meaning of antibiotic resistance and the consequences for themselves and society. There were different opinions and misunderstandings about the causes of antibiotic-resistant bacteria, transmission routes and its prevalence in society. There was a consciousness that an overconsumption of antibiotics could cause antibiotic-resistant bacteria, but they did not understand the real significance of the term antibiotic resistance. Some of the participants did consider this as a problem only for developing countries and not for Sweden.

The lack of knowledge resulted in difficulties in estimation of the risk for acquisition of antibiotic-resistant bacteria during their trip. Some of the participants had never thought about antibiotic-resistant bacteria before this study nor that there could be a risk of contracting such bacteria during their travel. In others, the issue of antibiotic resistance created an uncertainty which they tried to manage using different strategies. There were concerns about what to eat and drink, some thought that they should avoid meat and only eat vegetables, and others had the opposite opinion, to only eat meat and avoid vegetables. These strategies were not specific for the prevention of antibiotic-resistant bacteria but rather general measures to prevent illness abroad, in particular gastro-intestinal infections. However, the majority did not perceive acquisition as a possible risk while traveling and they distanced themselves from the problem. The risk was perceived to be less if the trip went to tourist areas rather than to rural areas, or if the journey was an organized bus tour. With this lack of knowledge about

antibiotic-resistant bacteria and unawareness of the risk for acquisition of such bacteria they embarked on their journeys to countries with a high prevalence of antibiotic-resistant bacteria.

In **Paper II** the study participants were fifteen of the travelers in **Paper** I, who had acquired a carriage of ESBL-producing bacteria during their trip. The participants had stayed in both urban and rural areas in their destination countries, and had traveled around using cars, buses, trains, airplanes and boats.

Paper II aimed to learn more about the participants' risk behavior and risk-taking during their journey and resulted in the core category *A need for knowledge to avoid risk-taking* was identified. The lack of knowledge of antibiotic-resistant bacteria and transmission routes influenced the participants´ behavior and risk-taking during their journey, resulting in most of them exposing themselves to risk situations of which they were mostly unaware. There was an opinion that they could live in the same way as local people, eating and drinking whatever locals did without any risk. Some were invited by locals for dinner in their private homes and did not perceive this as a risk since their hosts could eat and drink what they wanted without becoming ill. They ate raw vegetables and fruit, without reflecting on how and with what they had been rinsed, and they ate from buffets without bothering about the hygiene standard of the food. It was enough if the food looked fresh. Many drank bottled water, but brushed their teeth in tap water and washed the dishes in contaminated water or rain water. They visited dirty public toilets with difficulties to maintain adequate hand hygiene, and were unaware that antibiotic treatment could increase the risk of developing antibiotic-resistant bacteria. If they got diarrhea some used antibiotics without any clear diagnosis, and without knowing what tablets they were taking.

A few participants were aware of transmission routes of resistant bacteria, such as ESBL, but they ignored this and exposed themselves to the same type of risk situations as the unaware participants. Situations were described where they became more and more careless in their preventive measures as the trip went on. They knew that they should avoid unnecessary antibiotics, but when they became ill with gastro-intestinal symptoms, they took antibiotics without a diagnosis from a physician and sometimes without a prescription.

For the majority it was unclear why they had become carriers of ESBL, and they did not see that it could have been caused by their own risk behavior.

4.2 THE CARRIERS OF ESBL AND THEIR CARERS

A carriership of ESBL can affect the daily life of an individual, and if the carrier becomes a patient in healthcare he/she is dependent of the information and care of the healthcare staff. In turn, emotional impact and knowledge among staff concerning antibiotic-resistant bacteria, such as ESBL, could affect their willingness and skill in their care of patients or residents carrying such bacteria.

In **Paper III** the aim was to increase the understanding of how persons with ESBL perceive their situation as carriers of antibiotic-resistant bacteria, in daily life and in healthcare. In the analysis a core category was identified; *Being thrown into the scary and unknown without a map and compass*. The participants described a situation of anxiety and uncertainty before they received their diagnosis. Some had a previous medical history of urinary tract infections not responding to treatment, which led to questions as to whether the treatment and the diagnosis had been correct. They were dissatisfied and also upset about the way they were informed of their diagnosis, but also concerning the content of the information. The participants experienced that physicians and other healthcare staff had poor knowledge of ESBL, sometimes resulting in them receiving incorrect information.

This lack of knowledge concerned the contagion of ESBL-producing bacteria, their transmission routes and the consequences for patients´ daily lives. Some of the physicians gave incorrect information because of their lack of knowledge of ESBL. This insufficient, and sometimes incorrect information, caused fear, anger and uncertainty among the study participants. To cope with their daily lives the patients had to devise their own strategies to handle the consequences of ESBL. They constructed their own guidelines, which in many cases limited their daily life. There were routines about personal hygiene and hygiene for family members, cleaning and disinfection, avoiding socializing with other people and relatives and not using public transport.

There was a conviction among the participants that they had contracted ESBL through contact with the healthcare system. They perceived staff as ignorant, disrespectful and adopting nonchalant behavior. When the participants asked questions the staff were unwilling to answer them, either because they were unable to do so or did not have the time to answer them. Some experienced stigmatization described as “having the plague or cholera”. In their ignorance some of the staff engaged in excessive use of hygiene equipment, making study participants feel singled out and uncomfortable.

As the participants in **Paper III** sometimes felt stigmatized and treated in a disrespectful way by healthcare staff we wanted to search for the underlying causes of this. In **Paper IV** the purpose of the study was therefore to increase the knowledge of what it means for staff in acute care settings and nursing homes to care for patients and residents with ESBL-producing bacteria. As the environment is different between acute care settings and nursing homes the results are presented separately for the two settings.

In acute care settings the identified core category was *To operate as an expert in a chaotic environment*. Despite a lack of resources the participants were professional in their work and tried to give the patients the best possible care. Caring for patients with ESBL is a major challenge for healthcare staff. There is a risk of spreading the contagion between patients, and of being infected themselves. When ESBL was a "new contagion" there was fear among the staff of becoming personally infected, or passing the contagion to their families, which today has changed to a concern about not spreading the contagion between patients. The staff had also experienced in the early days that they sometimes applied safety measures too excessively, resulting in patients feeling stigmatized.

According to the Stockholm County Council´s guidelines ESBL-patients who have risk factors should be placed in a single room with a private bathroom. As there is a lack of single rooms in the county hospitals the participants felt frustrated over the patients' situation, since they often had to wait, sometimes for several hours in the emergency department while the physicians tried to find a single room.

Knowledge among staff of the agent ESBL, and of the guidelines and routine for care has increased over the years. Leadership was thought to be an important factor in the implementation of correct routines, since a lack of leadership led to informal managers emerging, who decided their own routines, which adversely affected patient safety. There were managers that broke the rules by taking too many patients onto the wards, and then asking the staff to write out a non-conformance report stating that the correct routines could not be followed. Also the Registered Nurses´ (RNs) had an important role as educators for the other staff, and needed to keep themselves informed. Despite a good knowledge of correct routines there were circumstances that sometimes made them impossible to follow. A lack of RNs, resulting in closed hospital beds and wards, caused situations where the remaining staff were overworked and stressed, which may have led to guidelines not being followed.

The emerged core category in nursing homes was *The employee who, despite uncertainty, provides good care*. Despite a lack of knowledge, and some fear, the participants tried to

provide residents with a good level of care. The participants described that fear was still present when caring for residents with ESBL, fear that primarily concerned the risk of becoming infected themselves or passing the contagion to their families. The level of formal education was not as extensive as in acute care settings and some had difficulties with the Swedish language. The fear sometimes caused a lack of respect and empathy for ESBL residents, resulting in excessive protective measures and avoiding contact with them. There were descriptions of a big turnover of employees, which resulted in substitute staff with a lower knowledge level. The lower level of knowledge caused more fear. Some of the staff had experienced difficult situations with infectious diseases in other countries, which had affected their perception of the spread of contagion. The situation of caring for residents with dementia carrying ESBL sometimes caused difficulties. Residents with dementia can increase the risk of transmission of contagion, often in relation to inadequate hand hygiene. The participants experienced this to be an ethical dilemma as the residents with dementia may not understand instructions, and cannot be locked into their rooms or be watched every second. In these circumstances the RNs' role as teachers and of providing support for the ANs and the managers was very important.

The participants described a continuing lack of knowledge of ESBL and guidelines, although the situation today was better today than some years before. Since the managers were not always RNs, and therefore sometimes lacked knowledge of medical issues, the RNs were thought to have an important role in educating the other staff about guidelines and correct routines.

The study participants in acute care settings and nursing homes in **Paper IV** struggled to give the ESBL- patients and residents the best possible care, and despite the many difficulties mentioned in the different environments they found the care of these patients and residents meaningful.

5 DISCUSSION

5.1 REFLECTIONS ON THE FINDINGS

The rapid increase of antibiotic-resistant bacteria, such as ESBL-producing *Enterobacteriaceae*, which threatens the treatment of common infections, has become a growing public health threat (2). Today, ESBL-producing bacteria constitute a growing problem for healthcare, nursing homes, as well as and for society. However, it is important to emphasize that independent of context the issue concerns human beings. It is humans who become carriers of ESBL; it is humans who may spread the contagion; it is humans who become ESBL-patients and humans who care for those patients in healthcare and nursing homes. The human aspects are thus the key elements of this thesis, which explores the consequences of the increasing prevalence of ESBL among Swedish citizens; as travelers who are at risk of acquiring ESBL abroad, as ESBL-patients in healthcare, and as staff caring for ESBL-patients and residents.

5.1.1 Knowledge, risk assessment and risk behavior among travelers

Knowledge of antibiotic resistance

Little was known about Swedish travelers' knowledge of antibiotic resistance or how they perceived the risk of becoming a carrier during travels to high-risk countries for ESBL. In **Paper I** the results showed that the participants lacked understanding of the causes and significance of antibiotic resistance, as well as of the possible consequences for society and for themselves. In accordance with previous studies (79, 81, 136), participants distanced themselves from the problem and believed antibiotic resistance to be a problem primarily for developing countries that did not affect healthy people who only visited such countries. Similar to a study by Norris et al (84) the participants also thought that one reason for the increasing level of antibiotic resistance was a general overprescribing of antibiotics. They knew that they should avoid antibiotics, but did not feel any personal responsibility for this development. The participants in the present study did not think that this was a concern for themselves or for Sweden, and this might be difficult to understand. Despite Sweden being a low-prevalence country for antibiotic-resistant bacteria the level is increasing (20), and the Swedish people do use, and sometimes misuse, antibiotics and healthy people do acquire carriership of such bacteria in Sweden and during travels abroad (83, 47-49). Traveling

abroad increases the risk of acquisition and the spread of antibiotic-resistant bacteria, especially now that tourism in other countries is common among the public in Sweden. The issue is important as there is a risk for acquisition of these bacteria during travels abroad and the travelers might unknowingly bring the contagion back home as asymptomatic fecal carriers with the attendant risk of spreading it to others or the environment (47-49). These results are surprising considering that the Swedish public receives frequent information about how and why they should avoid unnecessary use of antibiotics (137). Thus, there seems to be a need for improved information from regional and national authorities concerning the meaning of and the consequences of antibiotic resistance. Internet, videos and country-wide campaigns have been shown to be effective ways of imparting such information (138, 139).

Risk assessment of becoming a carrier of antibiotic-resistant bacteria

The travelers in **Paper I** did not perceive that there would be any major risk of acquisition of antibiotic-resistant bacteria during their time abroad. Some of the travelers had never thought about antibiotic-resistant bacteria, nor that there might be a risk of becoming a carrier during their travels. The risk of acquisition was perceived to be lower if they were going to tourist areas, or if the trip was an organized bus tour, but higher if they were going visit rural areas. This poor risk assessment is likely to be a consequence of a lack of knowledge of antibiotic resistance, transmission routes and available preventive measures, all of which indicates a need for improved pre-travel advice.

The issue of antibiotic-resistance caused uncertainty among travelers, and they mastered the situation by coping. Some thought that the problem did not exist (avoidance coping) and others suggested preventive measures that were not adequate (problem-focused coping). But these coping strategies made them master their uncertainty during the journey. There were several misunderstandings among the study participants about transmission routes and consequently also of how they could avoid acquiring antibiotic-resistant bacteria. There were great concerns about what to eat and what food you should avoid. Some of the participants thought you should avoid meat and only eat vegetables. Previous studies have shown that the risk for acquisition of ESBL is just as great for vegetarians as it is for meat eaters (140, 141). In healthcare and vaccination clinics pre-travel advice needs to be supplemented with information about preventive measures to avoid carriership of antibiotic-resistant bacteria. Today the advice given often concentrates on how to avoid gastrointestinal infections in general and this needs to be expanded to include how to avoid carriership of antibiotic-

resistant bacteria. It is important to highlight the importance of a good hand hygiene and to avoid drinking, brushing teeth or washing dishes in contaminated water. Further, one should avoid raw vegetables and fruit, which have not been rinsed in bottled water, and the use of antibiotics without prescription or diagnosis. There are travelers to foreign countries that do not visit a vaccination clinic before their trip, for example those traveling to Southern Europe, which is popular among Swedish tourists. In Southern Europe the prevalence of ESBL is higher than in Sweden (20) and this makes it necessary to provide a more general information to the public through media, national campaigns and internet. In the information from WHO about travel-related risks it states that it is important for travelers to investigate the epidemiology of infectious diseases in the destination country, but they do not mention the risk for acquiring antibiotic-resistant bacteria (142). As the numbers of international travelers continues to increase it becomes an urgent matter to prevent the spread of antibiotic-resistant bacteria across borders, and in Swedish society and healthcare.

Risk behavior and risk-taking for acquisition of ESBL during travels abroad

Travel to foreign countries involves the risk of becoming a carrier of ESBL. As stated previously, studies have shown that it is likely that the ESBL-producing bacteria are acquired from food, for example vegetables and fruit washed in water contaminated with fecal bacteria, in combination with poor hand hygiene (31, 37, 143, 144).

Some of the participants in **Paper I** did acquire ESBL during their trip. The aim of **Paper II** was to investigate what risks of acquisition of antibiotic-resistant bacteria these travelers had exposed themselves to during their trip. Previously, little was known about risk behavior and risk-taking among Swedish travelers who presented a positive test for ESBL-producing bacteria when returning from the abroad. The study showed that the participants´ lack of knowledge of antibiotic-resistant bacteria resulted in risk-taking during their journey, which may have led to them becoming carriers of ESBL-producing bacteria. A few of the participants had some knowledge about risk situations, but they ignored the risks and consciously exposed themselves to risks. This included eating raw vegetables and fruit that may have been rinsed in contaminated water, eating from buffets, brushing their teeth in tap water, washing their dishes in contaminated water, using antibiotics without diagnosis or prescription and being careless with hand hygiene.

Previous studies have shown that younger travelers were more willing to take travel-related health risks than older people or business travelers. Holidays were more often related to

"letting it all go" and looking for new experiences. This increased the risk of infections and accidents (93, 145). That adolescent and younger adults more often takes these sometimes unhealthy risks, compared with adults, can be considered to be normative, biologically driven and maybe inevitable (146). In a study comparing risk behavior between younger and older adult travelers the younger ones more often took conscious risks. For example they more often drank tap water or open drinks and ate food bought on the street compared with the older travelers (147). Such a pattern could not be seen in **Paper II**, which can be explained by the fact that most of the participants were older, with an average age of fifty-five years, and that there was a mix of holiday and business travelers. As the study participants were quite mature in age maybe the "letting it all go perspective" might be the current perspective among those who took conscious risks. There were opinions that the most important of all was to have a nice holiday.

In general the majority of the participants had a low level of knowledge of antibiotic resistant bacteria and in **Paper II** the results showed that they in their ignorance they exposed themselves to risk situations of which they were unaware. They ate raw vegetables and fruit, and did not consider how they might have been rinsed and they did not bother about the standard of hygiene for food. The participants brushed their teeth in tap water and washed the dishes in contaminated water or rain water, and they visited dirty public toilets where it was impossible to maintain adequate hand hygiene. Antibiotics were used without diagnosis or prescription. The difference between the conscious and the unconscious risk takers were that the latter were unaware of the risks in these situations. That might be the explanation as to why the participants exposed themselves to risk. They did not feel that they were exposed to risk and as a consequence of this they did not take appropriate safety precautions. These results are consistent with another study about risk perception among travelers, showing that many are not fully aware of health hazards, and do not always adopt protective measures (89).

Another misunderstanding among the participants was that they believed that if they acquired carriership of ESBL they would develop symptoms, such as for example diarrhea or fever. This is an important issue as most carriers of ESBL have an asymptomatic fecal carriage, and do not know anything about their carriership. There is therefore a risk of carriers unwittingly spreading ESBL to family members, to society, to the environment and into healthcare and nursing homes – like a "silent epidemic" (42, 52). This can be considered to be a major threat to public health and general information must be given to citizens about the risks and preventive measures necessary when travelling abroad. In **Paper I** and **Paper II** the results

showed a lack of knowledge among the study participants, which resulted in unconscious risk-taking during their journey, which may have led to them becoming carriers of ESBL-producing bacteria. The Swedish Public Health Agency (PHA) has national responsibility for public health issues, including infectious disease prevention. Strama (Swedish Strategic Programme against Antibiotic Resistance) provides the public with information about the use of antibiotics (137). Little attention has been paid by these organizations about information on preventive measures against acquisition of antibiotic-resistant bacteria while traveling.

Another travel issue that reinforces the importance of improved pre-travel advice about antibiotic-resistant bacteria is the increasing numbers of so-called "medical tourists". None of the study participants belonged to that category, but as this type of travel is a growing concern it is mentioned in this thesis. The issue concerns traveling abroad for healthcare, and common destinations are India, China, Mexico and the Middle East (54). As mentioned before these are areas with a high incidence of antibiotic- resistant bacteria, and individuals returning as carriers could constitute a risk for others. Since the year 2013, Swedish citizens have had the opportunity to seek care abroad with financial compensation in the countries of the European Union, and many of these countries have a higher prevalence of antibiotic-resistant bacteria than in Sweden (20). To the best of my knowledge "medical tourists" in Sweden do not receive such information, and it seems important that people get information about the risks in order to be able to decide whether they are willing to take those risks. This includes students going on clinical courses abroad, especially to countries with a high prevalence of antibiotic-resistant bacteria.

5.1.2 The carriers of ESBL and their carers

5.1.2.1 The carriers of ESBL

Also, little was known about the emotional impact and consequences for the daily life among persons who become carriers of ESBL. In **Paper III** the aim was to increase the knowledge about how carriers of ESBL perceived their situation on a daily basis as patients in healthcare. This knowledge was considered a significant factor for trying to make the life situation for a carrier of ESBL manageable and to avoid stigmatization from healthcare staff when they needed to seek care.

Consequences of being a carrier of ESBL in daily life

A large part of the results concerned information about diagnosis, how and when information was given and the content of the information given by the attending physician. None of the study participants was satisfied with this, experiencing physicians as ignorant and not receiving answers to their questions about the consequences for their daily life. The lack of proper information gave rise to many thoughts and varied emotions among the participants. It caused fear for their own health and of spreading the contagion to their families and friends; it caused anxiety and uncertainty for the future and it caused loneliness, disappointment, shame, anger and frustration. Being diagnosed with a contagious disease affects the individual´s life and is a stressful event. The lack of information also led to participants trying to find strategies to cope with life as an ESBL-carrier. Often they devised measures that limited their daily life; by not socializing with others, employing excessive measures for cleaning and disinfection, or not using public transport for fear of infecting others. The fear of passing the contagion to others led to some of them not daring to hug their children or grandchildren. In some cases, this also resulted in relatives and families not being informed of the diagnosis, which was unfortunate to say the least, considering that relatives play such an important supporting role. The feelings described by the study participants are similar to those found in studies of patients carrying MRSA (100, 103, 148, 149). The Swedish Patient Safety Act (2010:659) regulates the requirement for health and medical personnel to provide individually adjusted information to patients (97). Patients who receive poor information are at risk of becoming confused and anxious (150). If the information is not correct, stress levels increase, which sometimes leads to individuals taking inadequate or unnecessary measures. In the present study it was unfortunate that physicians, probably due to ignorance and without intent, gave incorrect information, which made patients feel bad instead of enabling them to live a good life with this diagnosis. The reason for this experienced low level of knowledge about ESBL bears discussion. Around 10 years ago when the ESBL was a “new pathogen”, few physicians knew what the implications were for a patient who became a carrier with such bacteria. Since then information, guidelines and recommendations have become readily available on internet for both physicians and patients. However, even today the knowledge of ESBL is limited among many physicians and they are sometimes too pressed for time to seek the correct information when they see a patient with this type of infection or carriership. In Paper III the great importance of being given correct information in order to be able to cope with everyday life has been highlighted. As the numbers of ESBL-carriers are increasing in society it is important that patients receive instruction about how to experience quality of life and not to suffer unnecessary restrictions.

Experiences of being an ESBL-patient in healthcare

There was a conviction among the participants that they had contracted the carriership of ESBL in contact with healthcare, and this caused frustration and anger. As patients in healthcare they felt stigmatized, as if they "had the plague or cholera". Stigma has been defined as a sign of disgrace or discredit, which sets a person apart from others (151). Stuber & Schlesinger (2006) defined two forms of stigma; identity and treatment stigma. The identity stigma concerns being labeled negatively and the treatment stigma about the expectations of being treated poorly by others. This might include friends, family and healthcare staff (152). In **Paper III** both types of stigma were identified in the study group. The patients experienced that they were labeled as an ESBL-diagnosis rather than as a human being, and also that they felt singled out and uncomfortable as a consequence of how they were treated by the staff. The healthcare staff were perceived ignorant and disrespectful in their treatment, resulting in sometimes insufficient hygiene routines but also sometimes far too comprehensive protective measures. That healthcare staff who neglect hygiene routines and fail to reflect on how their interactions with patients carrying resistant bacteria can lead to stigmatization has been revealed in studies of patients with MRSA (103, 105, 153). There are several possible explanations for why staff may treat ESBL-patients disrespectfully. The Swedish Health and Medical Act (1982:763), §2, states that "the objective of health care is good health and care on equal terms for the entire population". Care shall be provided with respect for the equal value of all and for human dignity" (154). Thus, stigmatization of ESBL-patients is not allowed and every patient should be treated in the same respectful way. When it comes to hygiene routines in Swedish healthcare there is a working method called "Standard precautions", regulated by law, which should be practiced in the care of every patient (114, 115). If healthcare staff use this method for every patient, including ESBL-patients, no one should feel discriminated or stigmatized. Sufficient knowledge among healthcare staff is important for the care of ESBL-patients and compliance with correct hygiene routines, and in some departments or units in Paper IV maybe some efforts to increase the knowledge level through expanded education should be taken in consideration. This study highlights the importance of increased education about ESBL and correct hygiene routines to preserve the dignity of ESBL-patients, and to maybe make them feel more like human beings than an ESBL-diagnosis.

5.1.2.2 The carers of ESBL patients and residents

Caring for patients and residents with ESBL is a major challenge for healthcare staff. There is a risk of spreading of the contagion between patients and residents, and being infected themselves. Fear among staff of becoming infected could affect their willingness to care for these patients, and patients are sometimes stigmatized by healthcare staff (99, 101, 105). In **Paper III** ESBL-patients described their experiences of healthcare. They were often dissatisfied because of insufficient information and disrespectful treatment from the staff which led to the question as to why this was so. The aim of **Paper IV** therefore was to increase the knowledge of what it meant for staff in acute care settings and nursing homes to care for patients and residents with ESBL-producing intestinal bacteria, and to try to find the underlying causes of why patients experienced their treatment in this way.

Knowledge, fear and compliance with guidelines

Fear was present among healthcare staff caring for patients and residents carrying ESBL in **Paper IV**, but the level of fear varied between acute care settings and nursing homes. In acute care settings fear has gradually reduced over the years. Earlier, staff were afraid of becoming personally infected or passing contagion to their families. Today they are more concerned about the risk of spreading the contagion to other patients. In contrast, staff in nursing homes still fear that they would become infected themselves, or bring the contagion back home to family and friends. This result is similar to previous studies where the fear about contracting an antibiotic-resistant bacteria infection is present among healthcare staff in acute care settings and nursing homes (100, 101, 103, 104, 155). One can discuss why healthcare staff are afraid and why the level of fear varies between acute care settings and nursing homes. Suominen et al (2010) reported on the relationship between the level of knowledge and of fear among healthcare staff. An increased level of knowledge reduced fear and increased the willingness to care for patients with infectious diseases (113). In acute care settings the study participants described how the knowledge of ESBL had increased over the years, and that the experience of caring for ESBL patients was less frightening today. In nursing homes the level of formal education sometimes was inferior to that of staff in acute care settings and it was more common that members of staff came from countries other than Sweden, which sometimes resulted in difficulties in understanding information in Swedish. Some of the staff in nursing homes had experienced difficult situations with infectious diseases in other countries and that may have affected their perception of the spread of

contagion. The result of these experiences could be extreme fear of contagion and an excessive use of protective clothing and gloves. The opposite perspective could involve no fear at all because healthcare staff were so used to being surrounded by contagious diseases, which might in turn result in a lack of hygiene measures. In nursing homes there were descriptions of a high turnover of employees, which resulted in substitute staff who often had a lower level of knowledge. The participants experienced that fear and the lack of knowledge in acute care settings and nursing homes sometimes caused a lack of respect and empathy for ESBL-patients and residents and sometimes made them feel stigmatized. Studies have also reported that inferior knowledge and fear could lead poor compliance with correct procedures and adherence to current guidelines, which could result in for example an excessive use of protective clothing (109). Similar results were also found in **Paper IV** involving excessive use of protective clothing, gloves and also surgical masks that could make patients and residents feel uncomfortable. It seems clear that healthcare staff must feel safe and be comfortable in their work, if they are to provide the best possible care for their patients and residents. Education about the correct procedures and guidelines is a central part of development towards a more satisfying working situation for healthcare staff. A previous study has shown that education is one of the cornerstones of improvement for hygiene practices (156). Information about this is always available on the internet, but **Paper IV** also emphasized the significant role of RNs' in educating ANs. In nursing homes managers sometimes lacked medical education, and this increased the need for RNs to act as teachers and made it important for the RNs to keep up with the current guidelines.

Working conditions

It is important for healthcare staff to have the right working conditions to make it possible for them to care properly for patients and residents with ESBL. According to the guidelines for ESBL patients in Stockholm County those with risk factors, such as diarrhea or wounds, should have a single room with a private bathroom. This is to prevent the spread of the contagion. Since there is a lack of single rooms in Stockholm County this has consequences for patients, healthcare staff become frustrated and sad, when they cannot offer the patient the best possible care. Patients carrying ESBL who need admission to hospital are often old, with multiple diseases, and they may have to wait for hours in the emergency department while the attending physician is searching for an available single room. Sometimes they have to move into another hospital. The lack of single rooms in older institutions in Sweden has been discussed and this problem is taken into consideration when new hospitals are built (157). In

Stockholm County there is also a lack of RNs, resulting in closed hospital beds and wards. The situation for the remaining staff, described in **Paper IV**, was that they were overworked and stressed, sometimes with the consequence that guidelines were not followed. This is similar to previous studies that have shown that overcrowding and understaffing may lead to failure in compliance with the current hygiene routines, which in turn may increase the spread of antibiotic-resistant bacteria and result in a lower level of patient safety (158-160). This is a situation where the safety for both healthcare staff and ESBL-patients comes into question.

The staff working in nursing homes explained that sometimes ethical problems arose when they were caring for residents with a dementia diagnosis who also were carriers of ESBL. It has been demonstrated that residents with dementia can increase the risk of transmission of infection, often in relation to inadequate hand hygiene (59-62). At the same time dementia residents cannot be locked into their rooms or watched every second. In these circumstances the results of **Paper IV** showed that the RN's role as a teacher and provider of support for both ANs and managers was very important.

Leadership and organizational culture

The study participants described the importance of good leadership and a good workplace culture in the organization to ensure compliance with guidelines and procedures. Organizations can be defined as groups of people that generally share some goals in common. They form common beliefs and values which differentiates them from other groups (161). It has been stated that strong leadership, starting from the very top of any healthcare organization, is essential for compliance with hygiene routines. Hospitals with strong leadership have showed better hand hygiene compliance and improved gowning/gloving practices compared with staff from other hospitals. Human behavior in infection control and prevention is influenced by various factors, including culture (162, 163). In **Paper IV** there were descriptions of both weak and strong managers in charge of infection control work. There were managers that in their lack of knowledge sometimes sanctioned incorrect routines and behaviors for the care of ESBL-patients and residents. A lack of leadership led to informal leaders emerging, who decided their own routines. There were managers who actively broke the rules by accepting too many patients onto the wards, and then asking the staff to write out non-conformance reports stating that established routines could not be followed. This organizational culture, where it is not necessary to follow current rules and guidelines, is unfortunate, since it puts the staff who want to do things in a correct way in an

untenable situation. On the other hand there were also descriptions of good managers, who worked to solve problems and create a pleasant workplace culture – "this is the way we do things around here". In such cultures there were no informal leaders and compliance with current procedures and guidelines was sufficient. These results emphasized the importance of good leadership, in the whole organization, for creating the right working environment for staff and providing good care for the ESBL patients and residents. Often, despite a lack of resources and with a sense of fear and lack of knowledge, the staff in acute care settings and nursing homes showed great empathy in providing the best possible care.

5.2 METHODOLOGICAL CONSIDERATIONS

5.2.1 Design, data sampling and data collection

The research questions for the thesis and included studies determined the choices of study designs and data collections. As the aims for the studies were to describe and increase the knowledge and understanding of different phenomena about ESBL qualitative methods were considered suitable. In all studies humans were involved, and we were interested in their personal experiences of the subject. In **Paper I** the aim was to describe the knowledge and understanding of antibiotic-resistant bacteria among Swedish travelers before departure, and a qualitative questionnaire was chosen for data collection. The choice of a questionnaire instead of an interview enabled us to cover a large number of participants. The study participants answered a questionnaire with three open-ended questions distributed by a vaccination clinic. There was a majority of women in the study group. Maybe women visit vaccination clinics more frequently than men, or maybe they are more willing to participate in scientific studies. This might have affected the results, but it is impossible to know in what way. To deal with the imbalance in gender we could have created a procedure where a certain number of each gender was asked to participate.

The aims of **Paper II, III** and **IV** were to increase knowledge, and understand the knowledge, risk assessment and emotional impact among Swedish travelers, ESBL patients and healthcare staff caring for ESBL-patients and residents. In these studies qualitative interviews were considered suitable as these allowed us a deeper understanding of the participants' feelings and experiences. In qualitative interviews the interviewer's role in

establishing a trusting relationship with the interviewee is important, as this allows the informants to tell their stories and experiences as freely as impossible (164, 165). To make this possible the study participants in these studies chose where the interview would be conducted, which varied from their homes or their working places to the interviewer's office. The study participants shared their experiences generously and freely, and the range of the transcribed text was extensive. In all these three studies the participation was voluntary and the participants contacted the interviewer themselves if they were interested. In **Paper II** the first fifteen volunteers were included in the study without regard to age, gender and destination countries. In **Paper III** only seven persons were interested in participating in the study so all participants were included. The reason for the low interest was unknown. The participants in **Study IV** represented three professions with good experience of caring for patients with ESBL. They represented various settings in healthcare and nursing homes. Their interest was reported by the manager or Head of the Department and the participants volunteered. Initially there were difficulties in recruiting physicians to the study, but after a reminder three physicians were included. There is no ideal sample size in a Grounded Theory study, rather it is based on participant saturation (124). Sandelowski (166, 167) argued that it is the richness of data that determines how many participants to include in the study, not the numbers per se (166, 167). There might be a risk involved when people sign up voluntarily to a research study; there are both advantages and disadvantages. The advantages might be that people are interested and motivated, and generously share their experiences and thoughts. The disadvantages could be that people volunteer for a certain reason, for instance that they are dissatisfied and want to complain. In **Paper I, II** and **IV** the participants appeared interested and with a wide range of both positive and negative experiences. In **Paper III** the negative experiences dominated, and there might have been a need for further information to motivate participation.

5.2.2 Data analysis and trustworthiness of the current studies

Numerous terms have been suggested for the interpretive perspective to articulate validity criteria in qualitative research (168). Lincoln and Guba (1985) posit that trustworthiness of a research study is important to evaluate its worth. In qualitative research some aspects need to be taken into consideration; credibility, dependability, confirmability and transferability, and these concepts are used by Lincoln & Guba to replace the terms "reliability" and "validity" which are usually linked to quantitative research (128, 169-171). Credibility involves the establishing the research to be believable, and it depends more on the richness of the

information gathered, rather than the amount of data gathered. Dependability ensures that the findings are consistent and could be repeated. Confirmability questions how the research findings are supported by the data collected and not by researcher bias, and finally transferability refers to the degree to which the findings are applicable in other contexts (171). These concepts are further discussed below.

5.2.2.1 Credibility

For the data analysis in **Paper I** content analysis according to Graneheim & Lundman (2004) was used (128). Credibility addresses the focus of the research process, how well data and analysis process address the intended focus (172). To achieve credibility in **Paper I** a variation in age, gender and destination countries was sought for. All visitors to a clinic for travel medicine and vaccinations in Stockholm during a particular time period, and planning a trip to our selected destination countries, were asked to participate. The number of participants was regarded as adequate for the study. In the results there was a dominance of women and that could perhaps have influenced the results. One suggestion could be that women have less knowledge of antibiotic resistance than men or that they are more unaware of the risk for acquisition of such bacteria during travel abroad. The answers were in most cases brief and one can ponder the reason for this; did the participants have a lack of time or of knowledge? The questionnaires were answered in the participants homes and one may ask whether they answered the questions themselves or with help from other family members, or if they had obtained information about antibiotic resistance from other information sources. As the results showed a low level of knowledge of antibiotic resistance and the risk for acquisition of such bacteria, these other possible "information channels" might not have adequate information on the subject. This might be an important result per se if the available official information is insufficient. As the answers in most cases were brief this made an interpretation with a higher abstraction level impossible, and the chosen method Content analysis according to Graneheim & Lundman was considered suitable. In the analysis process the researcher and one of the co-authors discussed the included moments until agreement was reached. To deepen the understanding the results from the questionnaire in **Paper I** was followed up by interviews in **Paper II.**

In **Paper II, III** and **Paper IV** the qualitative method Grounded Theory was selected for the analysis of individual interviews. As the aim was to deepen the understanding of the participants´ situation in different contexts Grounded Theory was considered an appropriate

method. In Grounded Theory data sampling should continue until saturation is reached, that is when new data does not add any new information to the study (165). One questions whether full saturation is possible? It is always a subjective decision to stop the data sampling, never knowing if new data might arise in the next interview. In **Paper III** full saturation may not have been reached as there was a limited study group. In **Paper II** and **Paper IV** it appears that saturation was reached. It seemed that no new data was emerging, but you never know if this situation might change with additional interviews. The emerging categories were discussed continuously by the researcher and one co-author. To achieve credibility in a Grounded Theory study there are some central criteria to be taken into consideration; the theory must fit and relevance, and it must work. Fit concerns how well the core category fits the aim of the study. The theory must Work, that is the theory must have the ability to explain, predict and interpret actions related to the phenomena (124). The identified core categories in Paper **II, III** and **Paper IV** "fitted and worked" for the studies. In order to increase the credibility of the studies the researcher tried to make the study participant feel comfortable during the interviews, and maybe this resulted in participants answering more honestly. The researcher had the opportunity to pose additional questions to ensure that the answers were perceived correctly. The credibility in all studies can be affected by the fact that the participants volunteered, questioning who volunteer. Is it persons who are dissatisfied and want to complain, or want to express an opinion? In all studies the participants said that they thought research was important and that they wanted to contribute to the development of research in this area. Credibility was also achieved through discussions of the studies in research seminars with other researchers in the field.

5.2.2.2 Dependability

Dependability refers to data being consistent over time for researchers and analysis techniques (173). Each process in the included studies in this thesis is reported in detail to make it possible for others to repeat the process and achieve similar results. As each study has been performed over a limited period of time there is no risk of inconsistency in the data collection due to a prolonged time period, and this strengthens dependability. The data collection, the transcription and the analysis in all studies were performed by the same person (the author of this thesis). It can be seen as a strength that the interview questions were presented by the same person and in the same way, but also a limitation that the researcher was familiar with the research field.

5.2.2.3 Confirmability

Confirmability questions how the research findings are supported by the data collected, and if the researcher has shown bias during the process. Confirmability tests the "objectivity" of research and is achieved when auditability, truth value and applicability are established (170, 171, 174, 175). Preconceptions are not the same as bias, unless the researcher fails to mention them. The fact that the main author of the studies has many years of experience as an Infection Control Nurse may have had some impact on both interviews and analyses in **Paper III** and **Paper IV**. In the analysis process the researcher and one of the co-authors discussed the findings until agreement was reached, and this co-author has comprehensive knowledge in the qualitative methods used in the included studies, but not specific knowledge of the subject. This could be seen as an advantage as the main author's knowledge of the subject otherwise might have influence the studies excessively.

5.2.2.4 Transferability

Transferability refers to the applicability of one set of findings to another setting. Transferability is often described as collaboration between the researcher and the readers. The researcher should provide detailed descriptions of self (the researcher as an instrument), context, processes and participants to allow the reader to decide how the findings may be transferable (173, 176). In all the studies included in this thesis there are descriptions of context, selection of participants, data collection and the data analysis, which may facilitate transferability to other settings or groups. There is also a rich presentation of the results, with suitable quotations, which could help the reader to increase transferability. The only thing we might know for sure is that the findings represent each group of study participants. It is the reader´s decision to evaluate the extent to which our findings apply to other contexts.

6 CONCLUSIONS AND CLINICAL IMPLICATIONS

Research should provide new knowledge, and this thesis provides new knowledge in an area that is current and important today – antibiotic resistance. ESBL-producing bacteria are the fastest increasing antibiotic-resistant bacteria in Sweden, and constitute a growing problem for healthcare, nursing homes, as well as for society as a whole. However, it is important to emphasize that we are dealing with human beings as carriers, patients and as healthcare staff caring for ESBL-patients and residents.

- Swedish citizens often travel abroad today, and **Paper I** and **Paper II** concerned Swedish travelers, before departure and after homecoming from travels to high-prevalence countries for ESBL. The results in Paper I showed that travelers had a lack of knowledge and understanding of the meaning of antibiotic resistance, as well as of the possible consequences for society and themselves. They did not perceive that there would be any major risk of acquisition of antibiotic-resistant bacteria during their trip.
- Some of the travelers aquired carriership of ESBL during their travels and in **Paper II** their risk assesment and risk behavior during the trip was examined. The limited knowledge of antibiotic-resistant bacteria and transmission routes influenced the participants´ behavior and risk-taking during their journey, resulting in most of them exposing themselves to risk situations of which they were mostly unaware. It was unclear for the participants why they had become carriers of ESBL, and they did not see that it could have been caused by their personal risk behavior.
- People do become carriers of ESBL and it affects their daily life. **Paper III** highlighted the great importance of the attending physician passing correct information about ESBL to enable people to cope with everyday life. The participants experienced a lack of information, which caused fear for their own health and for spreading the contagion to their families. They experienced the staff as lacking in knowledge about ESBL, leading to extreme hygiene measures, which caused patients to feel stigmatized.
- In **Paper IV** we wanted to search for the underlying causes for patients feeling stigmatized in healthcare, and increase the knowledge of what it means for staff in acute care settings and nursing homes to care for patients and residents with ESBL-producing bacteria. Fear was present among healthcare staff caring for ESBL-patients and residents, but the level of fear was higher in nursing homes than in acute care settings. The excessive use of protective clothing, gloves and also surgical masks

could make the patients and residents feel uncomfortable. In acute care settings there were a lack of nurses and single-rooms for ESBL-patients, resulting in staff being overworked and stressed, leading to guidelines sometimes not always being followed.

Clinical implications

- In healthcare and clinics for vaccination and travel medicine pre-travel advice needs to be supplemented with information about preventive measures for avoiding carriership of antibiotic-resistant bacteria.
- There is a need for improved information from regional and national authorities concerning the meaning of and the consequences of antibiotic resistance. Internet, videos and cross-country campaigns have been shown to be effective ways of spreading such information.
- It is important to increase the education of healthcare staff on ESBL and correct hygiene routines to improve information to patients and residents with ESBL, to help preserve the dignity of these patients, and reduce the risk of stigmatization.
- Healthcare staff must have adequate knowledge and reasonable working conditions to be able to provide the best possible care for patients and residents. Education is a central part in the development towards a more satisfying working environment for healthcare staff.

7 FUTURE RESEARCH

As the issue of antibiotic resistance is both current and urgent there is a need for further research from different perspectives; for example, the development of new antibiotics, patterns for the prescription and consumption of antibiotics, and epidemiology of antibiotic resistant bacteria.

As a continuation based on the results in this thesis possible areas of interest for further research are:

- Medical tourism. We do not have any knowledge about the frequency of antibiotic resistant bacteria among persons when they return after seeking healthcare abroad, neither within the European Union nor to foreign countries.

- Swedish tourists going on holiday to Southern Europe where the prevalence of antibiotic resistant bacteria is higher than in Sweden.

- Persons who have become carriers of ESBL-producing bacteria, have there been any improvements in the way they are cared for by healthcare staff; do they receive better information about their diagnosis today and are they being treated in a more respectful way than before?

- There is a need to continuously follow healthcare staff compliance with guidelines for infection control and hygiene measures, and to examine the factors for non-compliance. In the present thesis some of the factors have been described; the importance of good leadership, the knowledge level among the staff, and overcrowding and understaffing. To identify the local factors for non-compliance might increase awareness and could result in improved patient safety.

- The managers' role in their daily work with patients and residents with antibiotic resistant bacteria. How do they perceive their situation?

8 SAMMANFATTNING PÅ SVENSKA

Forskningen bör ge ny kunskap, och denna avhandling ger ny kunskap inom ett område som är aktuellt och viktigt i dag - antibiotikaresistens. Den snabba ökningen av antibiotikaresistenta bakterier, som äventyrar behandlingen av vanliga infektioner, har blivit ett allt större hot mot folkhälsan i hela världen. ESBL-producerande bakterier är de snabbast ökande antibiotikaresistenta bakterierna i Sverige och utgör ett växande problem för sjukvården, äldreboenden, liksom för hela samhället. Det är dock viktigt att betona att frågan berör människor. Det är människor som blir bärare av ESBL, det är människor som kan sprida smittan vidare, det är människor som blir ESBL-patienter och människor som vårdar sådana patienter och vårdtagare inom hälso- och sjukvård och på äldreboenden. De mänskliga aspekterna och konsekvenserna av ett ESBL-bärarskap var de viktigaste infallsvinklarna i denna avhandling.

Svenska medborgare reser ofta utomlands i dag, och **Studie I** och **Studie II** rör svenska resenärer, före avresa och efter hemkomsten från resor till länder med hög förekomst av ESBL. Resultaten i **Studie I** visade att resenärer hade bristande kunskap om och förståelse för betydelsen av begreppet antibiotikaresistens, liksom de möjliga konsekvenserna för samhället och för sig själva. De upplevde inte att det skulle finnas någon större risk att förvärva antibiotikaresistenta bakterier under sin kommande resa. Antibiotikaresistenta bakterier ansågs vara ett problem enbart för utvecklingsländer, och inte för Sverige, och de distanserade sig från problemet. Några av resenärerna förvärvade ett bärarskap av ESBL under sin resa och i **Studie II** undersöktes deras riskupplevelse och riskbeteende under resan. Den låga kunskapsnivån om antibiotikaresistenta bakterier och smittvägar påverkade deltagarnas beteende och risktagande under sin resa, vilket resulterade i att de flesta av dem utsatte sig för risksituationer som de oftast inte var medvetna om. Det var oklart för deltagarna varför de hade blivit bärare av ESBL, och de kunde inte se att det skulle ha orsakats av deras personliga riskbeteende. Svenska medborgare reser ofta till främmande länder, med risk för att ta med sig antibiotikaresistenta bakterier över gränserna, tillbaka hem till sina familjer, till omgivningen och till hälso- och sjukvården, och det finns ett stort behov av bättre råd innan avresan om vad man kan göra för att undvika ett bärarskap av sådana bakterier under utlandsresor. Informationen bör spridas genom olika medier, såsom kampanjer, genom video och internet, där nationella och regionala myndigheter har en viktig roll att spela.

Människor blir bärare av ESBL-producerande bakterier och det påverkar deras dagliga liv. I **Studie III**, där ESBL-bärande patienter intervjuades, betonades betydelsen av korrekt information om ESBL från den behandlande läkaren för att kunna klara av vardagen. Deltagarna upplevde en brist på information, vilket orsakade en rädsla för sin egen hälsa och för att sprida smitta till sina familjer och vänner, det orsakade oro och osäkerhet inför framtiden, liksom ensamhet, besvikelse, skam, ilska och frustration. Detta ledde till att deltagarna försökte hitta sina egna strategier för att hantera sitt liv som ESBL-bärare. Ofta konstruerades åtgärder som begränsade deras dagliga liv; genom att inte umgås med andra, omfattande åtgärder för rengöring och desinfektion, eller genom att inte använder kollektivtrafik beroende på rädsla för att smitta andra. Inom hälso- och sjukvården upplevde de personalen som okunniga om ESBL, vilket ibland resulterade i extrema hygienåtgärder från personalens sida, och detta medförde att patienterna ibland kände sig stigmatiserade. Betydelsen av ökad utbildning om ESBL uppmärksammades och vikten av att använda korrekta hygienrutiner för att bevara värdigheten hos ESBL-patienter betonades, och med det mindre stigmatisering.

I **Studie IV** undersökte vi de bakomliggande orsakerna till den stigmatisering ESBL-patienterna upplevde och ökade kunskapen om vad det innebär för personal inom slutenvården och på äldreboenden att ta hand om patienter och vårdtagare med ESBL-producerande bakterier. Rädsla var närvarande bland vårdpersonalen, men nivån av rädsla varierade mellan slutenvården och äldreboenden. Inom slutenvården har det skett en process under åren med mindre rädsla i dag. Tidigare innefattade rädslan att bli personligen smittad eller att vidarebefordra smittan till sina familjer, men idag var man mer oroad för att sprida smitta till andra patienter. Däremot var personalen på äldreboenden fortfarande oroliga för att de skulle smittas själva, eller föra smittan vidare hem till familj och vänner. Kunskapsnivån om ESBL var lägre på äldreboenden än inom slutenvården, och deltagarna upplevde att rädsla och bristande kunskap ibland orsakade en brist på respekt och empati för ESBL-patienter och vårdtagare, och ibland fick dem att känna stigmatiserade. Alltför överdriven användning av skyddskläder, handskar och även munskydd kunde göra att patienterna och vårdtagarna kände sig obekväma till mods. I slutenvården fanns en brist på sjuksköterskor och enkelrum för ESBL-patienter, vilket resulterade i att många av medarbetarna var överansträngda och stressade, vilket ledde till att riktlinjerna ibland inte följdes. Överbeläggningar och underbemanning kan leda till sämre följsamhet av gällande hygienrutiner, vilket i sin tur kan öka spridningen av antibiotikaresistenta bakterier och medföra sämre patientsäkerhet. Studien belyste också vikten av ett bra ledarskap och en god arbetsplatskultur inom organisationen för

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