

Infection prevention and control challenges in Flemish homecare nursing: a pilot study

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The importance of healthcare-associated infections (HAIs) in homecare (patients being cared for at their homes) is increasing year by year due to several factors. The first is a shift in focus from hospital care to homecare, a trend noted not only in Belgium but throughout Europe (Tarricone and Tsouros, 2008). This trend has been accelerated by governmental budget cuts

and the emergence of patient-centred care. Belgian hospitals are pushed by the government to limit the number of hospitalisation days, resulting in earlier discharge from the hospital even, for example, when indwelling catheters are in place for patients. Further, most patients prefer continuing their medical treatment at home (Ellenbecker et al, 2008). Nowadays, patients are discharged with central lines for the administration of antibiotics, chemotherapy or parenteral nutrition at home. This, in turn, mandates more advanced homecare, resulting in a need for additional training for homecare nurses, with a specific focus on infection control. Dedicated and well-trained healthcare staff are crucial to prevent potentially life-threatening infections, such as catheter-related blood-stream infections. Shang et al (2014) studied the patient risk factors for infections in a homecare setting, and one of their conclusions was that the risk of HAIs was higher among frail patients who are receiving invasive and advanced care at home, than that among non-frail patients and those not receiving intensive care at home (Shang et al, 2014).

Overall, data on HAI prevalence in the homecare setting are scarce in contrast with those in the hospital setting. A national Belgian survey performed in 2007 revealed an HAI prevalence of 6.2% in hospitalised patients (Vrijens et al, 2008). However, at present, no surveillance data are available in Belgium regarding the prevalence of HAIs in homecare settings. Even in the rest of Europe, only limited epidemiological data are available on HAIs in this specific setting, although leading organisations worldwide, such as World Health Organization (WHO), acknowledge the

ABSTRACT

Home nursing is evolving towards more invasive care. Nevertheless, no national data are available on the prevalence of HAI in this setting. The aim of this pilot study is to explore the Flemish home care setting as a first step toward a national surveillance program. A survey, focused on patient characteristics and HAI, was conducted between 7 May and 20 July 2018 on 711 Flemish patients. Most of the patients (74%) are 65 years or older and half of them had a form of comorbidity. Assisting with personal hygiene and wound care were the most frequent services delivered by home care nurses. A comparison of the prevalence of infections diagnosed by a physician or applying uniform criteria (ECDC), revealed a similar prevalence of skin and soft tissue infections (9% vs. 8.5%) and urinary tract infections (4% vs. 4.5%). A positive MDRO-screening was found in 6% of the patients. This pilot study is a first step towards a standardized national surveillance in home care to collect information on the prevalence of HAI and it reveals several interesting facts and study pitfalls for this setting.

KEY WORDS

- ◆ Homecare nursing ◆ Surveillance programme
- ◆ Infection prevention and control ◆ Healthcare-associated infection

increasing shift towards home-based care (Tarricone and Tsouros, 2008). A large-scale study performed in France in 2012 found the HAI prevalence to be 6.8% among patients receiving homecare, which is largely comparable with the prevalence of HAI detected in a hospital settings in Belgium (Miliani et al, 2015).

Since no data are available in Belgium on the prevalence of HAIs in homecare settings, the objective of the present study was to investigate the demographic characteristics, comorbidities and living conditions of this specific patient group, in order to better understand the indications for homecare nursing and to measure the prevalence of two types of HAIs (skin and soft tissue infections and urinary tract infections) in the Flemish homecare setting. These data may provide insights into the risks of contracting HAIs at home, which could, in turn, be a starting point to develop guidelines on infection control in homecare settings.

Methods

Settings

This study was conducted by the Flemish infection control group of home nurses (Flemish Infection Control Group of Home Nurses, 2020). As the Belgian Institute for Public Health (Sciensano) previously performed different point prevalence studies (PPS) according to the methodology of the European Centre for Disease Prevention and Control (ECDC) (European Centre for Disease Prevention and Control, 2014a; 2014b; 2014c), it played an advisory role in setting up the study.

All stakeholders in homecare in the Flanders region, specifically, public companies that provide homecare and the organisations representing independent homecare nurses, were contacted and asked to participate in the study. This group could be divided in two subgroups: home healthcare agencies and self-employed nurses.

Study design and data collection

The data collection period was between 7 May and 20 July 2018. The study protocol was based on a previous protocol on HAIs and antimicrobial use in European long-term care facilities (HALT-3 surveys) (ECDC, 2014a; 2014b; 2014c; 2016). All homecare nurses in Flanders were invited to participate in this study. A randomised selection, based on the sequence of the nurses' patient lists, was performed to include patients. After obtaining verbal informed consent from the patient, the participating homecare nurses were asked to fill in questionnaires based on the patient's healthcare record. The patient's consent was registered in the questionnaire.

This study and the methodology were approved by the ethics committee of Ghent University Hospital. A power calculation (based on the prevalence of homecare and an estimation of HAI) was performed using the online tool EPI-INFO, provided by the Centers for Disease Control and Prevention (CDC). According to this calculation, 2000 patients were required to generate representative results.

An e-learning module was developed to train participants in advance. Every participant was advised to view the

e-learning module (a Powerpoint presentation), but actual compliance was not monitored. A hotline was available by phone and e-mail (from 8 am until 10 pm everyday) to assist the nurses with completing the questionnaires.

In the first part of the questionnaire, the following patient data were collected: demographic data (age, sex, etc.), comorbidities, indication for homecare, mental status and living conditions (e.g. hygiene, sanitary facilities and presence of pets).

In the second part of the questionnaire, the prevalence of HAIs was investigated, and any causative multidrug-resistant organisms (MDRO) were recorded. Because of the high work pressure on home nurses, this study focused only on skin or soft tissue infections and UTIs, based on the prevalence of these infections in the homecare setting and the possibility for home nurses to evaluate these infections (Miliani et al, 2015).

All questions about infections were constructed in a similar way. An infection was considered present if it was confirmed by a clinician or if clear signs and symptoms of infection were present on the day of the survey. The ECDC case definitions, which were also used in the HALT-3 surveys, applied in the case of patients with symptomatic infections (ECDC, 2014a; 2014b; 2014c; 2016).

The infection control group performed a technical validation of the questionnaire and asked different home nurses to evaluate the survey for errors, clarity and comprehensibility.

Data analysis

The majority of questionnaires were completed on the web-based survey platform SNAP (Quality and Marketing Solution, Belgium, version 11.25). A preliminary data analysis was automatically performed by the platform. Statistical analyses were performed using MedCalc (MedCalc, Belgium, version 12.7.0.0).

Results

Some 711 patients were included by about 200 nurses during the data collection period. Most (82%) of the patients were recruited by homecare nurses working at a home healthcare agency, and only some (18%) were recruited by self-employed nurses.

Patient characteristics

The patient characteristics are shown in *Table 1*. The male-to-female ratio was 0.7. Most of the patients (74%) were 66 years old or above. Some 90% of the patients were living on their own with or without additional paramedical support. Other patients lived in residential care apartments, closed communities and special institutions (for example, a monastery).

Care activities provided by the nurses

The main tasks performed by the homecare nurses were assistance with personal hygiene and wound care. In some 20% of the visits, nurses were involved in adjusting the patient's medication (oral or intravenous), while fewer

Table 1. Patient characteristics

	N (%)
Sex	
Female	289 (41)
Male	420 (59)
Unknown	2 (<1)
Currently in a healthcare job?	
Yes	9 (1)
No	700 (99)
Unknown	2 (<1)
Age group (years)	
<40	37 (5)
40–65	146 (21)
66–75	154 (22)
76–85	228 (32)
>85	145 (20)
Unknown	1 (<1)
Place of residence	
Institution	9 (1)
Residential care apartment	44 (6)
Private home	635 (90)
Closed community	7 (1)
Other	16 (2)
Pets at home	
Yes	175 (25)
No	532 (75)
Unknown	4 (<1)
Disoriented (space/time)	
Yes	125 (18)
No	577 (81)
Unknown	9 (1)
Refusing any type of care	
Yes	63 (9)
No	640 (90)
Unknown	8 (1)
Comorbidities	
Yes	353 (50)
No	308 (43)
Unknown	50 (7)
Type of comorbidity*	
Diabetes mellitus	115 (16)
Other	105 (15)
Venous insufficiency/heart failure	104 (15)
Rheumatic disease	53 (8)
Cancer	49 (7)
Dementia	45 (6)
History of stroke	36 (5)
Depression	32 (5)
Chronic obstructive pulmonary disease	23 (3)

* The survey allowed multiple responses for this question.

patients needed more specialised care, for example, catheter care (Table 2).

Standard of living

More than 99% of all patients had access to running water and a flushable toilet. About 10% did not have a shower or

Table 2. Homecare nursing activities and their frequency

Task	N (%)
Hygiene-related care	487 (69)
Wound care	315 (44)
Ointment application	126 (18)
Urinary catheter care	38 (5)
Stoma care	55 (8)
Compression therapy	162 (23)
Oral medication administration	147 (21)
Intramuscular injection	119 (17)
Venous catheter care	27 (4)
Other technical nursing task	104 (15)
Other non-technical nursing task	52 (7)

* The survey allowed multiple responses for this question.

a bath. In 25% of the cases, a pet had access to the room where the homecare activities took place (before, during or after the care session).

Comorbidities

Some 50% patients had some form of comorbidity. The most frequent diagnoses were diabetes mellitus (16%), venous insufficiency or heart failure (15%), rheumatic diseases (8%), cancer (7%) and dementia (6%) (Table 1). In 15% of patients, a comorbidity was recorded by the nurse without further specification.

Around 24% patients used some type of medical device (Table 3). Most of these devices were urinary catheters, followed by venous catheters. Of the urinary catheters (n=74), 58 (8%) were suprapubic catheters, 13 were urethral catheters (2%) and three (<1%) were nephrostomies.

Intravenous therapy was prescribed for 42 (6%) patients (Table 4). The few indications that were specified were chemotherapy (six patients), outpatient parenteral antimicrobial therapy (nine patients) and parenteral nutrition (five patients). In more than half of these patients (52%), the indication was scored as 'other'.

MDRO screening

Unfortunately, MDRO screening was not performed, not marked in the patient data record or unavailable to the homecare nurses in the vast majority of patients (94%).

A positive MDRO screening, performed in the month preceding the questionnaire, was found in 43 (6%) patients (Table 5). In half of these patients (n=21), the screening was positive for methicillin-resistant *Staphylococcus aureus*. Extended-spectrum beta-lactamase-producing organisms (ESBL), carbapenemase-producing Enterobacteriaceae (CPE) and vancomycin-resistant *Enterococcus* (VRE) were each recorded once in the survey. In nearly half of the positive screenings (n=19), the homecare nurses selected 'other' as the MDRO type.

Urinary tract infections

A UTI diagnosed by a physician was recorded in 29 (4%) of the patients. Most of these infections were cystitis cases, and

Table 3. Medical device use

Type of device	N (%)
Venous or arterial catheter	46 (6.5)
Implantable venous access systems	28 (3.9)
Peripheral venous catheter	12 (1.7)
Central venous catheter/PICC	6 (0.8)
Urinary catheter	74 (10.4)
Suprapubic	58 (8.2)
Urethral	13 (1.8)
Nephrostomy	3 (0.4)
Other devices	29 (4.1)
PEG probe	17 (2.4)
Wound drain	3 (0.4)
External fixator	2 (0.3)
Vacuum-assisted wound closure	7 (1.0)
Not defined	28 (3.9)
Total	177 (24.9)

PICC= peripherally inserted central catheter;
PEG=percutaneous endoscopic gastrostomy

Table 4. Indications for intravenous therapy

Intravenous therapy administered	N (%)
Yes	42 (6)
Chemotherapy	6 (1)
Outpatient parenteral antimicrobial therapy	9 (1)
Parenteral nutrition	5 (1)
Other type of intravenous therapy	22 (3)
No	667 (94)
Unknown	2 (<1)

most of the diagnosed patients (80%) received intravenous or oral antibiotic therapy. In total, 23 patients received some form of local therapy (e.g. bladder flush), and nine of these patients were diagnosed with an UTI. According to the UTI criteria used in the HALT-3 study (ECDC, 2016), 32 patients (4.5%) had a UTI (Table 5). Thus, the physician's diagnosis and HALT-3 criteria correlated relatively well ($r=0.96$).

Skin and soft tissue infections

A physician diagnosed a skin and soft tissue infection in 66 patients (9%) (Table 5). The most prevalent types of infections were infected chronic ulcer ($n=16$), post-operative wound infection ($n=12$) and infected diabetic foot ulcers ($n=9$). In 50 patients, a swab for bacterial culture was taken. The homecare nurses registered the presence of local or systemic symptoms in 127 patients. According to the HALT-3 criteria, 61 (8.5%) of these cases could be confirmed as a wound infection. A Cohen's kappa correlation of 0.93 was found between the diagnosis and HALT-3 criteria (ECDC, 2016).

Discussion

This study provides some insights into the Flemish homecare system, which might differ from that in other European countries. The aim of this study was to describe the most

prevalent care activities performed by homecare nurses in Flanders. Despite the growing use of homecare, there are no Belgian data available on the extent to which invasive techniques are used in this setting. This can be explained by the fact that data collection in this setting is very difficult, as there is no co-ordinating body for homecare. Some nurses work for a home healthcare agency, while others are self-employed. At present, insights into their daily care activities are limited.

As life expectancy progressively increases and more patients are treated at home for economic and social reasons, the incidence of HAIs in homecare is likely to increase. Demographic data show that the majority of homecare patients are of advanced age, which is a known risk factor for HAIs (Shang et al, 2014). The findings of the study indicate that most of the activities regularly undertaken by homecare nurses are related to hygiene and chronic wounds. The situation in France, as reported by Milianni et al (2015), is completely different. The population in Milianni et al's (2015) study received advanced care at home, implying that the patients had more severe conditions and needed more invasive devices as compared with the setting in the present study. An overall HAI prevalence of 6.8% was reported in the present study, while Manangan et al (2002) reported a substantially higher infection rate of 16%. This difference in the HAI rates could be explained by the different settings of homecare in different countries and the included patient population, and highlights the importance of local, standardised surveillance programmes.

Environmental conditions and challenges in homecare

A major challenge faced by homecare nurses relates to the environmental conditions, namely, the patient's living conditions and hygiene standards. According to our survey, almost all patients had access to clean water and sanitation, and the large majority had a bath or shower. However, the presence of pets and the access the animals had to the place where homecare activities were undertaken (a quarter of the cases) indicate the challenges that homecare nurses face in providing good, hygienic care. Felemban et al (2015) addressed this issue in their study, in which homecare nurses reported soiled, cluttered and filthy work environments as a challenge to infection control and prevention. Further, the considerable variation in the working environments of homecare nurses complicates the development of simple and uniform infection control guidelines for homecare.

Felemban et al (2015) described two additional challenges: access to appropriate material and patients' personal hygiene. The questionnaire in the present study did not focus on the equipment required by homecare nurses, but, in most cases, this obstacle can be addressed through simple measures, such as alcohol-based hand rubs or wipes and gloves. On the other hand, patients' personal hygiene is a more difficult challenge to overcome. In the present study, 9% of the patients refused any type of care, and, in most cases, this concerned assistance with maintaining personal hygiene (e.g. washing). The lack of personal hygiene naturally impedes

infection control measures, especially because the homecare nurse has no choice but to use the materials available at the patient's home for this purpose, for example, their clothes, soap and towels (Felemban et al, 2015). When wound care is performed, materials such as dressing packs, dressings and plasters are necessary, and in Belgium, patients are often responsible, depending on the healthcare system, for buying the appropriate materials themselves. Proper storage of this equipment can be problematic, and financial concerns can force homecare nurses to re-use disposable products.

Medical devices in homecare: a prevalent risk factor

In a hospital ward, patients can be categorised according to the condition they have, and any guidelines can easily be adapted according to the ward and/or the patient group. For homecare nurses, however, standardisation of guidelines is very difficult, as every patient's case is different. Data from the present study showed a wide variety in the type of care required and the comorbidities among the 711 patients included. As described above, homecare nurses mostly provide personal hygiene and wound care for older individuals. They rarely have to provide other forms of nursing care that carry higher risks of infection control breaches, for example, indwelling catheter care, which carries a high risk of HAI (Shang et al, 2014). In the present study, some 25% of the patients had a medical device, and 6% received intravenous therapy at home. A standardised procedure for infection prevention and control (IPC) with medical devices, including those used for IV therapy, needs to be developed for homecare. Infections have been documented in homecare settings in association with central lines and even needle-less devices for intravenous infusion (Danzig et al, 1995; Kellerman et al, 1996; Do et al, 1999).

Challenges related to HAIs in homecare settings

Definitions

To the best of the authors' knowledge, no recent European data are available on HAIs in homecare settings, and such surveillance data could improve the understanding of the needs and challenges of homecare provision. An important hurdle is the absence of an internationally accepted definition for an HAI occurring at home. According to the definition provided by the Association for Professionals in Infection Control and Epidemiology (APIC), healthcare-associated infections in homecare are defined as infections that were neither present nor incubating at the time of initiation of care in the patient's place or residence. HAI that develop within 48 hours after discharge from a healthcare facility, are reported back to the facility that discharged the patient prior to homecare services (Association for Professionals in Infection Control and Epidemiology, 2008). If benchmarking rates are to be established, consensus definitions such as those published by APIC will have to be implemented (Manangan et al, 2002; Association for Professionals in Infection Control and Epidemiology, 2008).

Table 5. MDRO and healthcare-associated infections

MDRO	N (%)		N (%)
<i>Stayed in a healthcare facility the past 48 hours</i>			
Yes	25 (3.5)	No	686 (96.5)
<i>Visited a healthcare facility without staying there in the past 48 hours</i>			
Yes	85 (12)	No	626 (88)
<i>Visited at home by a professional healthcare worker (besides home nurse)</i>			
Yes	453 (63.7)	No	258 (36.3)
UTIs	N (%)		N (%)
<i>Presence of UTI symptoms</i>			
Yes	44 (6)	No	660 (94)
<i>Urine culture performed</i>			
Yes	37 (5.2)	No	657 (92.4)
Unknown	17 (2.4)		
<i>UTI treatment administered</i>			
Antibiotics IV/PO	25 (4)	No	640 (90)
Local therapy (bladder flush)	23 (3.2)	Unknown	20 (3)
<i>UTI diagnosed by doctor</i>			
Yes	30 (4.2)	No	667 (95.2)
Unknown	14 (2)		
<i>UTI according to HALT-3 criteria (urinary tract infection probable)</i>			
Yes	32 (4.5)	No	679 (95.5)
Wound infections	N (%)		N (%)
<i>Presence of local or systemic symptoms</i>			
Yes	127 (17.9)	No	584 (82.1)
<i>Wound culture performed</i>			
Yes	50 (7)	No	661 (93)
<i>Wound infection diagnosed by doctor</i>			
Yes	66 (9.3)	No	645 (90.7)
<i>Wound infection according to HALT-3 criteria (confirmed wound infection)</i>			
Yes	61 (8.6)	No	650 (91.4)

MDRO=multidrug-resistant organism; UTI=urinary tract infection; IV=intravenous; PO=by mouth; HALT-3=Healthcare-associated infections and antimicrobial use in European long-term care facilities

The HALT-3 criteria form a good base for clinical diagnosis of several types of infections (ECDC, 2016). A potential limitation of these criteria, however, is that laboratory data are needed for some infection types. This

KEY POINTS

- ◆ Homecare nursing is evolving towards more invasive care (e.g. intravenous therapy) without an adapted infection control programme
- ◆ About 25% of homecare patients had a medical device
- ◆ Infection control training and multidrug-resistant organism screening are not well known and implemented in this setting
- ◆ The tested ECDC HALT criteria seem to have a good correlation with the doctor's diagnosis of an urinary tract or skin infection, which will be useful in future surveillance programmes

CPD REFLECTIVE QUESTIONS

- ◆ What could be the main differences between infection control programmes for hospitals and homecare?
- ◆ The current segregation of infection control in home and hospital care limits communication lines. How can this be improved?
- ◆ Is your training on infection prevention and control updated on a regular basis? If not, how do you keep your skills updated?

is inconvenient for surveillance and could lead to skewed prevalence data for the different types of infection.

Data collection

A part of data collection depended on communication with the GP or reviewing the notes in the patients' healthcare records. The lack of information on MDRO colonisation could be due to a miscommunication between these healthcare services. In Belgium, nurses are legally not allowed to order laboratory testing, so the availability of data on MDRO screening depended completely on the patient's GPs, who, in general, have less frequent contact with patients compared with homecare nurses. Besides communication with the GP, adequate communication with hospitals or other care facilities is also crucial in MDRO management. A standardised transfer document between healthcare facilities and homecare can be part of the solution.

In this study, MDRO screening yielded positive results in 6% of the patients, and the causative organism in half these cases was MRSA. To the authors' knowledge, no data are available on MRSA prevalence in the community in Belgium. An MRSA prevalence of 9% in Belgian nursing homes was described in a national surveillance report (Jans et al, 2016). Unlike CPE, ESBL and VRE, MRSA is well established in primary care. GPs do not commonly encounter the latter three organisms, and no screening guidelines are available for these pathogens in this setting. Therefore, their prevalence is most probably underestimated.

The other half of the MDRO-positive screening results were categorised as 'other', despite the drop-down list in the questionnaire. Surveillance requires well-trained contributors, and it appears that there is a lack of knowledge concerning MDROs among Flemish homecare nurses. The nurses in this study participated on a voluntary basis with no additional compensation, but completing the survey

and including at least four patients was time-consuming. An e-learning guide was provided to help the participants complete the questionnaire. This was probably not an adequate tool.

As concluded by Manangan et al (2002), there is a need for education and training in IPC for health professionals providing homecare, and hospitals could play an important role in supporting IPC training. Home nurses are trained to provide care to patients, and adherence to standard precautions and the correct use and availability of personal protective equipment should contribute to IPC. In the present study, homecare nurses may not have been the most suitable candidates to complete the questionnaires. Future studies should include GPs and quality-assurance nurses in such surveys.

Accreditation in homecare is still in its infancy. In Flanders, only one organisation met the standards of quality and safety of care and prevention of HAI. Accreditation can be the ideal boost for the practical implementation of additional IPC measures and surveillance protocols.

Overall, about 4% of the patients in the present study were diagnosed with a UTI and 10% with a skin and soft tissue infection. There was good agreement between the diagnosis made by the doctor and the symptom-based diagnosis using the HALT-3 criteria. A concern is the observation that a substantial proportion of patients diagnosed with a UTI were treated with local therapy (via bladder flush). This could probably be explained by a lack of knowledge among the homecare nurses or the questionnaire being unclear. In most cases, bladder flushes are performed in patients with urinary catheters, to prevent obstructions. It is possible that some homecare nurses misinterpreted this to be a form of antimicrobial therapy.

Limitations

Our study has several limitations. The target of at least 2000 completed surveys was not reached. The low number of included patients prevented reliable estimation of the HAI prevalence and determination of the independent risk factors of HAI in Flemish homecare settings. Second, the questionnaire was misinterpreted despite repeated discussions and pilot tests performed by the infection control group. A clear illustration of this is with the use of the term 'medical devices'. In a hospital context, medical devices are mostly foreign medical bodies, such as indwelling lines or probes, but homecare nurses use this term to include crutches or a wheelchair. It is, therefore, possible that they scored these kind of devices as 'other', resulting in a potential overestimation of medical device use. With regard to MDRO carriage, negative results could not be distinguished from unknown results as there were many incomplete answers, probably due to the unclear formulation of the questions and perhaps, lack of awareness among the responders. Third, free text was not allowed in an attempt to standardise the results. For some questions, this led to the 'other' category being significant, without any available context. For example, in 105 patients, comorbidities were scored as 'other', making result interpretation impossible. These limitations

all underscore the importance of questionnaire validation by those working in the field.

Steps towards (inter)national guidelines

In Belgium, there is no national surveillance programme available for IPC in homecare settings, and the present pilot study may be a step towards this guidance development. Several hurdles have to be tackled: the complexity of the Belgian healthcare system will make it difficult to decide who is responsible for developing and funding such a programme. The lack of a standardised European or international programme for IPC in homecare setting brings to light various practical questions concerning the type of questions and HAIs that need to be addressed in this surveillance.

Home healthcare offers several benefits, such as having a positive effect on the patient's wellbeing and a potential reduction in public expenditure. With the worldwide population ageing rapidly, healthcare systems everywhere will be under even greater pressure, and reduced lengths of hospital stays are expected, with a shift towards home healthcare. The home setting, as compared to the hospital environment, implies an intrinsically reduced risk for the patient to develop HAIs, leading to further cost savings. Improved governmental funding and further development of home healthcare are, therefore, of utmost importance to optimise patient care.

Conclusions

This study provides some insights into the Flemish landscape of homecare nursing and may contribute to subsequent studies on the risk of infections in this setting. The authors believe that a standardised national survey is essential to collect more data on the prevalence of HAIs in homecare settings, which may help in the development of IPC guidelines specifically adapted for homecare nursing. In the past few years, many protocols, studies and guidelines have been introduced to promote IPC in nursing homes, but for patients receiving increasingly invasive and advanced care at home, the literature and guidelines are lacking (Mackay et al, 2014). To support homecare services, funding is urgently needed, with a focus on ensuring adequate staff numbers and their appropriate training. **BJCN**

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- Association for Professionals in Infection Control and Epidemiology. HICPAC surveillance definitions for home health care and home hospice infections. 2008. <https://tinyurl.com/rqxwlpb> (accessed 18 February 2020)
- Danzig LE, Short LJ, Collins K et al. Bloodstream infections associated with a needleless intravenous infusion system in patients receiving home infusion therapy. *JAMA*. 1995; 273(23):1862–1864
- Do AN, Ray BJ, Banerjee SN et al. Bloodstream infection associated with needleless device use and the importance of infection-control practices in the home health care setting. *J Infect Dis*. 1999; 179(2):442–448. <https://doi.org/10.1086/314592>
- European Centre for Disease Prevention and Control. Protocol for point prevalence surveys of healthcare-associated infections and antimicrobial use in European long-term care facilities. Version v.2014. 2014a. <https://tinyurl.com/qt7297u> (accessed 18 February 2020)
- European Centre for Disease Prevention and Control. Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities, May–September 2010. 2014b. <https://tinyurl.com/rhwu4ez> (accessed 18 February 2020)
- European Centre for Disease Prevention and Control. Point prevalence survey of healthcare-associated infections and antimicrobial use in European long-term care facilities, April–May 2013. 2014c. <https://tinyurl.com/v6x7hpo> (accessed 18 February 2020)
- European Centre for Disease Prevention and Control. Protocol for validation of point prevalence surveys of healthcare-associated infection and antimicrobial use in European long-term care facilities. Annex 4. Case definitions of infections. 2016. <https://tinyurl.com/tyamwqm> (accessed 19 February 2020)
- Ellenbecker CH, Samia L, Cushman MJ, Alster K. Patient safety and quality in home health care. In: Hughes RG (ed). *Patient safety and quality: an evidence-based handbook for nurses*. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008
- Felmban O, St John W, Shaban RZ. Infection prevention and control in home nursing: case study of four organisations in Australia. *Br J Community Nurs*. 2015; 20(9):451–457. <https://doi.org/10.12968/bjcn.2015.20.9.451>
- Flemish Infection Control Group of Home Nurses (NVKVV). Home page [in Flemish]. 2020. <https://tinyurl.com/uwqgdwp> (accessed 18 February 2020)
- Jans B, Latour K, Catry B et al. Nationale prevalentiestudie van dragerschap van resistente bacteriën bij bewoners van woonzorgcentra in België in 2015: Eindrapport – Juli 2016 [in Flemish]. 2016. <https://tinyurl.com/vdkep7> (accessed 12 February 2020)
- Kellerman S, Shay DK, Howard J et al. Bloodstream infections in home infusion patients: the influence of race and needleless intravascular access devices. *J Pediatr*. 1996; 129(5):711–717. [https://doi.org/10.1016/s0022-3476\(96\)70154-3](https://doi.org/10.1016/s0022-3476(96)70154-3)
- Mackay WG, Smith K, Williams C, Chalmers C, Masterton R. A review of infection control in community healthcare: new challenges but old foes. *Eur J Clin Microbiol Infect Dis*. 2014; 33(12):2121–2130. <https://doi.org/10.1007/s10096-014-2191-y>
- Manangan LP, Pearson ML, Tokars JL, Miller E, Jarvis WR. Feasibility of national surveillance of health-care-associated infections in home-care settings. *Emerg Infect Dis*. 2002; 8(3):233–236. <https://doi.org/10.3201/eid0803.010098>
- Miliani K, Miguères B, Verjat-Trannoy D et al. National point prevalence survey of healthcare-associated infections and antimicrobial use in French home care settings, May to June 2012. *Euro Surveill*. 2015; 20(27). pii: 21182. <https://doi.org/10.2807/1560-7917.es2015.20.27.21182>
- Shang J, Ma C, Poghosyan L, Dowding D, Stone P. The prevalence of infections and patient risk factors in home health care: a systematic review. *Am J Infect Control*. 2014; 42(5):479–484. <https://doi.org/10.1016/j.ajic.2013.12.018>
- Tarricone R, Tsouros AD; World Health Organization. Home care in Europe: the solid facts. 2008. <https://tinyurl.com/ybybu5pe> (accessed 18 February 2020)
- Vrijens F, Gordts B, De Laet C et al. Nosocomiale infecties in België, deel 1: nationale prevalentiestudie [In Flemish]. 2008. <https://tinyurl.com/tvhd848> (accessed 18 February 2020)

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