

Surveillance of infections in nursing homes in the Netherlands, a systematic survey is feasible

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doi: 10.3396/IJIC.v10i4.026.14

Abstract

The SNIV network is a national surveillance system involving nursing homes on a voluntary base. The aim of the SNIV network is to provide systematic year-round surveillance data on the incidence of infections in nursing homes for local interventions and national policymaking and for the development of infection control guidelines.

The network was designed as a sentinel active surveillance network involving nurse practitioners and/or elderly care physicians who report weekly on incident infectious diseases (gastro-enteritis, influenza-like illness, probable pneumonia and the addition of urinary tract infections in 2011) in their nursing home based on clinical definitions.

The average weekly incidence per 1000 residents in the years 2009 till 2012 varied by year: gastro-enteritis: 3.8, 4.6, 3.7, 2.5; influenza-like illness: 1.6, 0.4, 0.5, 1.8; probable pneumonia: 3.6, 3.7, 2.9, 3.5; urinary tract infections: 8.0, 9.6 per 1000 resident weeks in 2011 and 2012. Gastro-enteritis most frequently occurred in local outbreaks and incidence peaked in winter. Incidence of influenza-like illness only showed a seasonal pattern in 2009 due to absence of infections with A(H1N1) influenza virus in nursing home residents.

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The results from our nationwide on-going weekly surveillance into the incidence of infections in nursing homes show that systematic surveillance in nursing homes is feasible. These data provides insight into seasonal patterns and risk factors for infection needed to guide infection control efforts and form the basis for comparisons between institutions and within regions. Furthermore, these data provide a solid baseline when studying the effectiveness of intervention strategies in the nursing home setting.

Keywords: Public health surveillance; Nursing homes; Infection control and methods; Netherlands

Introduction

Since 2009, the national sentinel Surveillance Network on Infectious Diseases in Nursing Homes (SNIV) registers weekly the number of new infections in participating nursing homes. The aim of the SNIV network is to provide systematic year-round surveillance data to gain insight into incidence trends of infections in nursing homes and to provide tools for local interventions to optimize infection control. On a national level, the surveillance helps to develop infection control guidelines for nursing home setting.

Background

In the Netherlands, there are approximately 400 nursing homes with 61,000 residents, this is 6% of the total population of those 65 years or older in the Netherlands. Residents no longer have their own general practitioner but an elderly care physician in the nursing home provides first-line medical care. A publication by the Netherlands Institute for Social Research in 2011 shows that the physical health of elderly in nursing homes in 2008 was worse than in 2000.¹ The residents in 2008 had more often chronic diseases or physical limitations and several studies show that the morbidity and mortality of some infectious diseases are higher in elderly rather than young people.^{2,3} Infections also lead to a decline in general well-being.⁴ However, we know that the incidence of infections and their impact can reduce by dedicated hygiene and infection prevention measures and the effect of interventions, which prevent infection diseases, can be monitored by surveillance. Insight into the incidence of the infections helps the nursing homes guide and prioritize the implementation of infection prevention measures.

Methods

Participate in the SNIV network is on voluntary basis. Nursing homes were recruited through the academic

networks in the Netherlands and by a nationwide mailing to all the nursing homes to get a represented network for the country. When nursing homes show their interest in SNIV, the project team give a presentation on location. The SNIV project team was also present on congress and symposia for elderly care physicians, trough workshops and presentations they show them that infection registration is the first step in the infection prevention circle. Only nursing homes with more than fifty residents were able to participate in the network and all the residents living in the nursing homes were eligible. Infections were report weekly through a web-based application. The types of infections registered were gastro-enteritis, influenza like illness, probable pneumonia and urinary tract infections. An expert team of elderly care physicians and researchers from the national institute for public health and environment chose these infections. Registration of an infection was based on clinical case definitions that conform to medical practice in the nursing home setting in the Netherlands. The definitions were developed in collaboration with elderly care physicians and the Advisory Committee of SNIV (table I). Only new episodes of an infection were registered. In addition, information regarding the organization, the population and the characteristics of the nursing home was collect once a year by a questionnaire. The participating nursing homes can make reports of their own results with the report function of the web-based registration application and they get a feedback report every year where they can compare their results with nursing homes with the same institutional and population characteristics. Results are presented as weekly incidence rates, calculated as the total number of cases in one week divided by the total number of residents in the participating nursing homes in that week (resident-weeks), assuming that the total number of residents is the total number of beds each week. To study trends in infections the moving average

technique was used and 5-week moving averages were calculated.

Results

Table II shows the characteristics of the participating nursing homes from 2009 until 2012. The mean incidences per 1000 resident for each infectious disease from 2009 till 2012 are given in table III. Figure 1 shows the evolution of the incidence of

the infectious diseases from 2009 till 2012. Gastro-enteritis most frequently occurred in local outbreaks and incidence peaked in winter.

Nursing homes with regular exchange of personnel between wards had higher incidences of gastro-enteritis (table IV). Incidence of influenza-like illness only showed a seasonal pattern in 2009 due to absence of infections with A(H1N1) influenza virus in nursing

Table I. Clinical definitions of health care associated infections registered in SNIV

Gastro-enteritis

The resident must have one of the following four conditions:

- a. diarrhoea 3 or more episodes in 24h, deviating from normal for this person
- b. diarrhoea and 2 of the following symptoms: fever, vomiting, nausea, stomach ache, abdominal cramps, blood or mucus in stool
- c. vomiting and 2 of the following symptoms: fever, nausea, stomach ache, abdominal cramps, blood or mucus in stool
- d. vomiting 3 or more episodes in 24h (without other symptoms and vomiting is not related to the use of medication)

Influenza like illness

The resident must meet the following conditions:

- an acute start of symptoms
- *and* at least one of the following systemic symptoms: fever or febrile feeling, malaise, headache, myalgia
- *and* at least one of the following three respiratory symptoms: cough, sore throat, shortness of breath

Probable pneumonia

The resident must have at least one of the following symptoms are suspected of low respiratory infection, probably pneumonia, as they occur as change compared to the former situation and other likely diagnoses are excluded:

- tachypnoe, malaise, confusion, shortness of breath, cough (productive or non-productive), fever > 38°C of fever in the last 48 hours, pain in the chest (respiratory)
- *and* with new focal (unilateral) abnormalities on auscultation of the lungs

Urinary tract infections

The resident must have

(following is based on the guideline by the Dutch Association of Elderly Care Physicians):

- general or urinary-related symptoms (painful, frequent urination, abdominal symptoms, anorexia, increased confusion, drowsiness, fatigue, increased incontinence of urine and reduced mobility, in the absence of a source of infection elsewhere).
- *and* signs of inflammation (detected by microscopic examination or by leukocyte esterase test of urine sediment)
- *and* a bacteriuria (determined with nitrite test or urine culture (not applicable to catheter use)

Table II. Characteristics of the participating nursing homes from 2009 till 2012.

Characteristics	2009	2010	2011	2012
Nursing homes (n)	25	28	25	19
Residents weeks	177677	158628	136746	106888
Number of beds (median, range)	158 (62-284)	130 (41-234)	128 (56-234)	124 (56-199)
Number of residents (median, range)	156 (62-280)	130 (41-230)	128 (56-230)	106 (56-199)
Nursing staff (number) (median, range)	296 (70-680)	292 (20-619)	200 (64-451)	189 (64-529)
1-person rooms ($\geq 50\%$)	18%	50%	58%	71%
Own bathroom ($\geq 50\%$)	0%	10%	24%	34%
Infection (prevention) committee (%)	88%	85%	79%	94%
Interchange of personnel between ward (%)	41%	30%	16%	31%
Influenza vaccination coverage among residents (median, range)	92% (70%-99%)	95% (70%-98%)	95% (70%-100%)	95% (70%-100%)
Influenza vaccination coverage among personnel (median, range)	16% (4%-52%)	20% (5%-50%)	17% (4%-65%)	18% (5%-50%)
Number common rooms (median, range)	4 (1-13)	5 (1-18)	5 (1-20)	6 (1-20)

Table III. Mean incidences per 1000 resident weeks and ranges in 2012

	Gastro-enteritis	Influenza like illness (ILI)	Probable pneumonia	Urinary tract infections*
2009	3.8	1.6	3.6	-
2010	4.6	0.4	3.7	-
2011	3.7	0.5	2.9	8.0
2012	2.5 (0.0-7.8)	1.8 (0.0-17.8)	3.5 (0.19-12.0)	9.6 (0.3-21.2)

*started in 2011

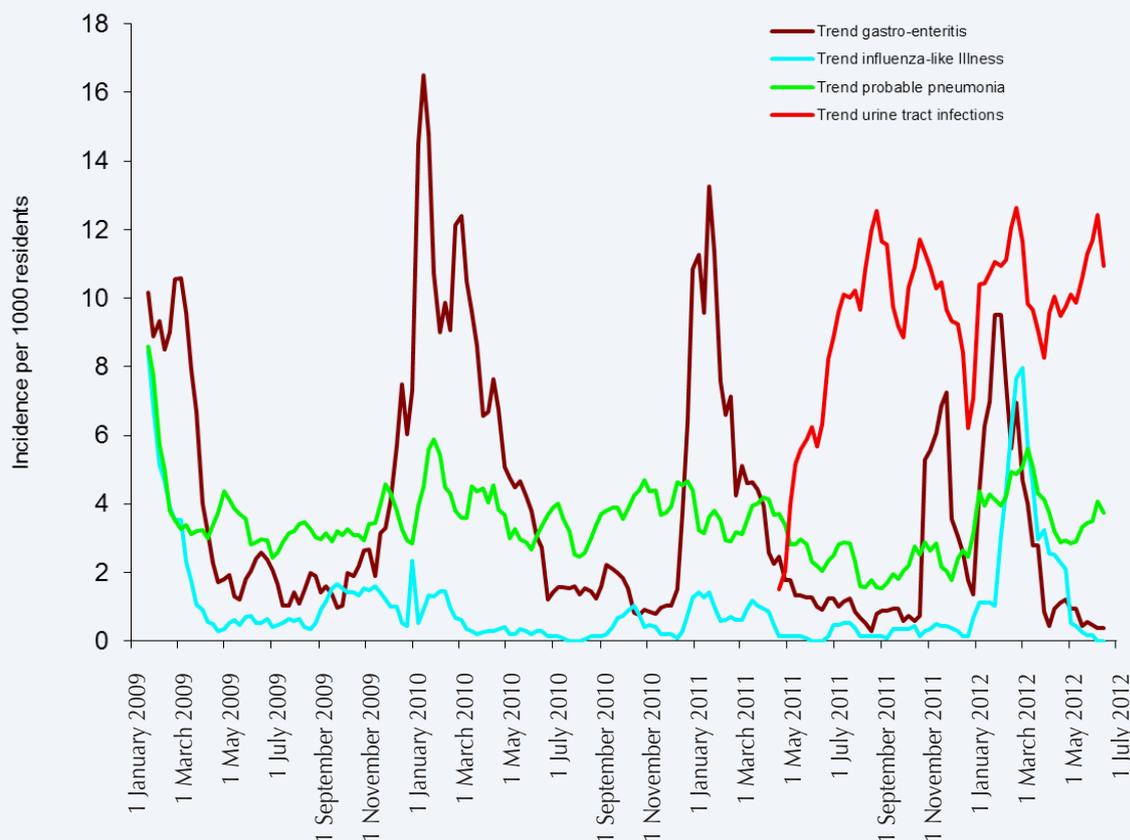


Figure 1. 5-weekly incidence of the infectious diseases from 2009 till 2012

Table IV. Mean gastro enteritis incidences per 1000 resident weeks for regular and incidental interchange of personnel between wards

Regular interchange of personnel between wards				Incidental interchange of personnel between wards			
2009	2010	2011	2012	2009	2010	2011	2012
4.9	5.9	1.6	3.4	2.7	4.1	3.6	2.2

home residents in the next years. Nursing homes with higher seasonal influenza vaccination coverage among personnel had lower incidences of influenza like illness (table V). The incidence of probable pneumonia is more stable but follows the incidence of ILI. Nursing homes with higher percentage of private bathrooms had higher incidences of probable pneumonia (table VI).

UTI are the most common infections found in SNIV. However, every nursing home has its own point of intervention. In table 7 the 2012 incidence range for the infections is given. The individual reports show that some nursing homes have a high incidence for all

infections and some have a high incidence for just one or two infectious disease.⁵

Discussion

This is the first publication about the incidence of infectious diseases in Dutch nursing home residence. There are a few limitations on this study. First, it is difficult to compare the results with incidence studies in the rest of Europe since we do not use the same criteria. The studies that are published in other countries use the Mc Geer criteria and we made our own because we wanted to follow the medical practice in the nursing home setting in the Netherlands.^{6,7,8} Second limitation

Table V. Mean influenza like illness incidences per 1000 resident weeks for influenza vaccination coverage of personnel higher or lower than 17%

Influenza vaccination coverage personnel \geq 17%				Influenza vaccination coverage personnel $<$ 17%			
2009	2010	2011	2012	2009	2010	2011	2012
0.9	0.4	0.8	1.0	2.1	0.5	0.2	2.5

Table VI. Mean probably pneumonia incidences per 1000 resident weeks for residents with or without a private bath room

Residents with private bathroom \geq 50%				Residents with private bath room $<$ 50%			
2009	2010	2011	2012	2009*	2010	2011	2012
-	5.8	4.3	5.4		3.5	2.2	2.7

* Not asked

is the fact that the nursing homes participate in the SNIV network on voluntary base. The incidence rate of infections could be lower than in other Dutch nursing homes, while we expect that the nursing homes who participate in SNIV are more aware of infection prevention than others. Finally not only the total number of participating nursing homes changed over the years, there are also nursing homes who stopped in the meanwhile and others who started. Seven houses start in 2009 and are still participating in the network.

The reports from SNIV are a helping hand to improve local infection prevention policy. By participation in the SNIV network, nursing homes show their awareness of infectious diseases and the possibility to prevent them. From hospitals, we know that participating in surveillance of infections alone already reduces the incidence of infectious disease.⁹

All over, we see that UTI are the most common infections found in SNIV, which is in accordance to the results of a recent prevalence study in the Netherlands.¹⁰

There are national guidelines for infection control in the Netherlands but given the variability in incidence of infectious disease, it becomes clear that every nursing home should tailor their approach, based on the national guidelines,¹¹ to the local situation.

There are two remarkable results; nursing homes with regular interchange of personnel between wards had a higher incidence of gastro-enteritis. A hypothesis might be that interchange of personnel facilitates the spread of pathogens that cause gastro-enteritis while there are problems with hand hygiene. Secondly, nursing homes with a higher percentage of private bathrooms had higher incidences of probable pneumonia. It could be that private bathrooms probably are less often used and therefore might be a possible source of legionella. But is also possible that more severely ill residents are the once who get a private room with private bathroom. Further study of pathogens in residents with probable pneumonia is necessary to gain more insight.

Similar to other studies,¹² we found that nursing homes with higher seasonal influenza vaccination coverage among personnel had lower incidences of Influenza like illness.

The preliminary results give the nursing homes several points to start from when implementing interventions. Furthermore, the network can be used to carry out intervention studies such as improve the hand hygiene compliance to optimize infection prevention control in the nursing home setting and to stimulate the development of infection control guidelines tailored for the nursing home setting.

Acknowledgement

We want to thank all participating nursing homes within the SNIV network. The network is funded by the Ministry of Health, Welfare and Sport.

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