Impact of the 2009 influenza A(H1N1) pandemic on public health workers in the Netherlands

L Vinck¹, L Isken (leslie.isken@rivm.nl)¹, M Hooiveld², M C Trompenaars³, J IJzermans², A Timen¹

1. Preparedness and Response Unit, Centre for Infectious Disease Control, National Institute for Public Health and the Environment (RIVM), Bilthoven, the Netherlands
2. Netherlands Institute for Health Services Research, Utrecht, the Netherlands
3. Public Health Service Rotterdam-Rijnmond, Rotterdam, the Netherlands

Citation style for this article:

Vinck L, Isken L, Hooiveld M, Trompenaars MC, IJzermans J, Timen A. Impact of the 2009 influenza A(H1N1) pandemic on public health workers in the Netherlands. *Euro Surveill.* 2011;16(7):pii=19793. Available online: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19793>

Article published on 17 February 2011

A cross-sectional study was undertaken to analyse the impact of the 2009 influenza A(H1N1) pandemic on frontline public health workers in the Netherlands and to consider its implications for future pandemics. A structured, self-administered questionnaire was made available online (26 March to 26 May 2010) for frontline public health workers employed by the communicable disease departments of the public health services in the Netherlands (n=302). A total of 166 questionnaires (55%) were completed. The majority of respondents reported an increased workload, perceived as too busy (117 respondents, 70.5%) or extreme (13 respondents, 7.8%). Most respondents were not anxious about becoming infected (only seven were regularly concerned). The overall compliance with the control measures was good. The case definition was strictly applied by 110 of the 166 respondents (66%); 56 of 141 (39.7%) consistently consulted the Preparedness and Response Unit within a centralised assessment system, while 68 of 141 (48.2%) consulted the unit only at the beginning of the pandemic. Of 145 respondents with available data, 128 (88.3%) always used personal protective equipment. Reported adherence to the advice to discuss the various isolation measures with patients and their contacts was between 71% and 98.7%. Our study shows that the surveyed frontline public health workers considered the workload to be high during the first 3.5 months of the pandemic and their level of anxiety about becoming infected was reported to be low. During the pandemic, these workers were able to accommodate what they considered to be an excessive workload, even though initially their assignments were unfamiliar to them.

Introduction

On 25 April 2009, the World Health Organization (WHO) declared the outbreak of influenza A(H1N1)2009 to be a public health emergency of international concern [1]. On 11 June 2009, WHO raised the pandemic alert level to phase 6, thereby acknowledging a worldwide pandemic [2]. In the Netherlands, influenza A(H1N1) 2009 virus infection became mandatorily notifiable on 29 April 2009, as a group A disease. This group consists

of diseases that pose a very serious threat to public health and thus require national control decisions and coordination. Physicians and staff in laboratories that suspect or confirm a group A disease in a patient need to notify the regional public health service, which then reports anonymised patient data to the Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (RIVM). Within the Centre for Infectious Disease Control, the Preparedness and Response Unit is responsible for coordinating disease control and implementing national control policies. During the pandemic, the unit worked closely with the local public health services.

From 30 April to 15 August 2009, infection with influenza A(H1N1)2009 virus was reported in 1,473 cases nationwide [3]. The policy for carrying out active case finding was defined on 29 April 2009. Patients were classified according to the national case definition, which is based on the European Union case definition [4]. The epidemiological criteria within the case definition changed frequently as the affected areas with sustained human-to-human transmission changed.

The assessment and management of each case (including the need for sampling, classification according to the case definition, assessment of the risk of infection in close contacts, provision of antiviral drug prophylaxis, monitoring of home isolation procedures for cases and their contacts and informing them about the isolation measures and the need for them) was done by frontline public health workers from the public health services together with an expert from the Preparedness and Response Unit (until 29 June 2009), within a centralised assessment system. Initially, samples were taken from all patients with suspected influenza A(H1N1)2009 virus infection and their contacts and antiviral drugs were given if the diagnosis was confirmed. From 15 June 2009, antiviral drugs were also administered to probable cases (i.e. without confirmation of the diagnosis). Personal protective equipment (FFP2 masks, gloves, gown and goggles) was provided for health professionals who took the samples. After

10 July 2009, FFP1 masks and gloves were considered sufficient, as there was increasing evidence that these would prevent droplet transmission. After 22 July 2009, general practitioners were responsible for assessing and managing individual cases and when clusters of cases appeared, they contacted public health service professionals.

As the number of cases increased rapidly during the summer and the clinical picture proved to be relatively mild [5], the notification procedure was adjusted on 15 August 2009. From then, only hospitalised patients or deaths due to influenza A(H1N1)2009 were notified to the public health service. This approach was consistent with the WHO pandemic plans stating that where there is widespread community transmission, containment strategies requiring control measures for each individual case should be replaced by mitigation strategies [6]. In the Netherlands, between 24 April 2009 and 24 June 2010, a total of 2,196 patients with influenza A(H1N1)2009 virus infection were hospitalised and 63 died. Of the deceased patients, 53 had an underlying disease [7].

It is known that communicable disease outbreaks can have a substantial impact on healthcare workers [8], as a result of increased workload, uncertainty about the pathogenicity of the causative agent and anxiety about becoming infected [9,10]. However, there is limited knowledge on the impact of a pandemic on healthcare workers, as the most recent pandemic was the 1968 influenza pandemic [11]. During the 2009 influenza pandemic, public health workers were requested to function as the first-line filter in assessing, sampling and treating cases, meaning that they had to perform new tasks that required additional skills – tasks that interfered with their usual daily routine. Our goal was therefore to assess the consequences of the 2009 influenza A(H1N1) pandemic on frontline public health workers (public health physicians, public health nurses and health department managers) employed by a public health service in the Netherlands in order to contribute to a knowledge base for optimising response strategies in future infectious disease outbreaks.

Methods

Study population

In the Netherlands, there are 28 public health services employing 302 frontline public health workers (119 public health physicians, 166 public health nurses and 17 health department managers). The smallest public health service has a catchment area of 216,403 inhabitants, the largest has 1,245,516.

Questionnaire development and administration

A structured, self-administered questionnaire was developed on the basis of a literature study (using MEDLINE) and 11 in-depth interviews with frontline public health workers (the search strategy and results of the literature study and interviews are available from the authors on request). The questionnaire was tested

in a pilot study – to assess its feasibility and completeness – involving two public health workers, two policy advisors from the Preparedness and Response Unit and seven regional public health consultants. After revision, based on the results of the pilot study, the final questionnaire was made available online to the 302 frontline public health workers from 26 March to 26 May 2010. A hyperlink was sent to them by the Preparedness and Response Unit, along with a request to complete the questionnaire.

The questionnaire addressed the first months of the pandemic (29 April to 15 August 2009). Several topics were covered: 12 questions addressed the characteristics of the respondents (profession, sex, age, whether there were children in household, years of work experience, previous experience of working in an infectious disease outbreak, amount of days worked per week, amount of overtime worked, whether they had had direct contact with a confirmed case, whether they had had an infection with influenza A(H1N1)2009 virus, whether they assumed that they had been infected with influenza A(H1N1)2009 virus during work and whether any family members had been infected); other questions were related to perceived workload (n=10), anxiety about becoming infected (n=4) and compliance with the control measures (n=7). The 10 questions for measuring workload were a validated set of questions [12] that are often used to measure workload in medium or small businesses.

At the start of the questionnaire, a detailed timeline was displayed, showing all control measures taken, to facilitate the respondents' recall.

Variables

We composed overall scales for two variables: perceived workload (Cronbach's alpha of 0.886) and anxiety of becoming infected (Cronbach's alpha of 0.799). The validated set of questions on workload used a four-point Likert scale (1 = never; 2 = sometimes; 3 = regularly; 4 = always) and consisted of questions such as 'were you working under time pressure?' and 'did you have to work extra hard to finish your work?' The questions were combined to create the variable perceived workload, which reflected the retrospectively reported perceived workload. Workload was categorised as a relaxed (10–14 points), normal (15–20 points), too busy (21–30 points) and extreme (31–40 points).

For the second variable (anxiety of becoming infected), responses to statements concerning home isolation measures were dichotomised: neutral responses (neither agreed nor disagreed) were excluded from the analysis.

To increase our understanding of the differences between the public health services, three other variables were created. The variable 'degree of urbanisation' was created based on data from Statistics Netherlands (CBS) [13]. The variable 'catchment area'

was based on data received from the Dutch association of public health services (GGD Nederland) (categories: regions with 200,000–500,000 inhabitants, those with 500,001–900,000 and those with 900,001–1,200,000). The variable ‘objective workload’ was based on the number of cases for which the respondents had consulted the Preparedness and Response Unit within the centralised assessment system of each public health service (categories: 0–40 cases, 41–80 cases and 81–120 cases).

Data analysis

Data were analysed using SPSS v. 18.0. Descriptive statistics (frequencies) were generated. Means were calculated for the answers given on the Likert scale. Differences in means were assessed by Student’s t-tests. Differences in proportions were assessed by chi-square test. A p value of ≤ 0.05 was considered statistically significant. Cronbach’s alpha was used to assess whether various questions could be combined: the cut-off value was 0.6. Statements with responses ranging from ‘totally disagree’ to ‘totally agree’ were recoded 1 to 5 and four-point scales were recoded 1 to 4. Parametric and non-parametric tests and analysis of covariance (ANCOVA) for regression analysis were used when appropriate. Non-responder analysis was performed for sex and profession.

Results

Of the 302 public health workers contacted, 166 completed the questionnaire (response rate: 55%). Responses were received from all 28 public health services. The proportion of responders among the public health physicians was higher than the proportion of responders among the public health nurses ($p=0.023$). The general features of the respondents are listed in Table 1.

Non-responder analysis showed that the male–female ratio was not significantly different between responders and non-responders ($p=0.221$).

Workload

Of the 166 respondents, 117 (70.5%) reported that they were too busy, 13 (7.8%) had an extreme workload, while 36 (21.7%) had a normal or a relaxed workload, during the first months of the pandemic (29 April 2009 to 15 August 2009) (Figure).

A higher perceived workload was associated with a higher degree of urbanisation of the public health service (ANCOVA F-value (1, 162)=9,223, $p=0.003$) and with regularly working overtime (F(2, 162)=4,687, $p=0.010$). There were no differences in perceived workload between respondents who worked full-time (4–5 days per week) and those who worked part-time (1–3 days per week).

Anxiety about becoming infected

The level of anxiety about becoming infected during the pandemic was relatively low among the respondents:

100 (60.2%) had no fear of infection at all, 59 (35.5%) were sometimes worried about infection and seven (4.2%) were regularly afraid of becoming infected. Having children ($p=0.030$) and having doubts about the effectiveness of personal protective measures taken ($p=0.044$) increased the level of anxiety regarding infection.

Compliance with control measures

We measured how consistently the respondents had applied the criteria for the case definition that was issued to identify suspected patients from whom sampled had to be taken. We also measured the amount of consultation with the centralised assessment system for the final classification of patients, the extent of use of personal protective equipment during sampling and home visits and whether the workers informed patients and contacts about the isolation measures.

Case definition

Of the 166 respondents, 110 (66.3%) reported that they had always strictly followed the case definition, while 50 (30.1%) had only occasionally followed the case definition (Table 2). The main reasons for not following the case definition were that there was already sustained transmission of the influenza A(H1N1)2009 virus in many other countries not included in the case definition (56.6%), that patients or general practitioners applied pressure on the respondents (15%) or because the respondents felt that the criteria defining a contact were too strict (9.6%). Respondents who were public health physicians followed the case definition less strictly than those who were public health nurses ($p=0.000$) and compliance was lower in male respondents compared with female respondents ($p=0.002$).

Centralised assessment

Of 141 respondents, 56 (39.7%) reported that until 29 June 2009 they always consulted the Preparedness and Response Unit for centralised assessment, 68 (48.2%) consulted the unit only at the beginning of the pandemic, while 17 sometimes ($n=14$, 9.9%) or never ($n=3$, 2.1%) consulted the unit (Table 2). Reasons for non-compliance were that they found it unnecessary (38.3%), time consuming (22.7%) or that the assessments were sometimes contradictory or divergent from the advice specified in the case definition (9.9%). Female respondents consulted the unit less often than male respondents ($p=0.008$). The compliance of respondents who regularly worked overtime was reduced compared with those who did not ($p=0.024$).

Personal protective equipment

Personal protective equipment was always used by 128 of 145 respondents (88.3%), regularly by 15 (10.3%) and only sometimes by two (1.4%) (Table 2). The extent of use of personal protective equipment was higher in female respondents ($p=0.037$) and in those who had been working at a public health service for one to 10 years ($p=0.034$).

TABLE 1General characteristics of questionnaire respondents during 29 April to 15 August 2009, Netherlands (n=166)^a

Characteristic	Percentage of respondents ^b	Number of respondents
Sex		
Female	66	110
Male	34	56
Profession		
Public health physician	46	77
Public health nurse	51	85
Health department manager	2	4
Age (years)		
<25	4	7
26–35	26	44
36–45	26	44
46–55	32	54
56–65	10	17
Children in household (n=165)		
Yes	50	83
No	50	82
Number of years of work experience		
<1	7	12
1–5	38	63
6–10	30	49
>11	25	42
Previous work experience in an infectious disease outbreak		
Yes	49	81
No	51	85
Number of working days per week		
1	8	14
2	11	19
3	29	48
4	28	47
5	23	38
Working overtime		
Regularly	62	103
Sometimes	34	57
Never	4	6
Having had direct contact with a confirmed case		
Yes	76	127
No	23	39
Had had an influenza A(H1N1)2009 virus infection		
Yes, laboratory confirmed	1	2
Considered as likely	19	32
No	79	132
Infected with influenza A(H1N1)2009 virus during work (n=34)		
Yes	3	1
Considered as likely	27	9
No	62	21
Did not know	8	3
Family member with laboratory-confirmed influenza A(H1N1)2009 virus infection (n=136)		
Yes	7	9
No	70	95
Did not know	23	32

^a Unless otherwise indicated.^b The percentages in some categories do not total 100% due to rounding.

Informing patients and contacts about isolation measures

Of 121 respondents, 86 (71.1%) had always told patients that they should wear a mask indoors. Of 156 respondents, 154 (98.7%) had always informed patients about the need for social distancing and 142 of 149 respondents (95.3%) reported that they had informed patients that they were not supposed to leave their home while they were still ill. Further, 145 of 149 respondents (97.3%) had always provided patients with a leaflet containing a summary of the information about isolation measures (Table 2).

Working overtime was associated with increased compliance with informing patients that they were not supposed to leave their home while ill ($p=0.048$) and providing patients with the information leaflet ($p=0.002$). The confidence of respondents regarding the effectiveness of the home isolation measures was positively associated with informing patients

about wearing a mask indoors ($p=0.006$) and about social distancing ($p=0.004$) and informing them that they were not supposed to leave their home while ill ($p=0.044$).

The perceived workload, anxiety of becoming infected and compliance with control measures were not influenced by the number of inhabitants within the catchment area of the public health service or by the number of cases for which consultation within the centralised assessment system of each public health service with the Preparedness and Response Unit was carried out (objective workload).

Discussion and conclusions

This study is one of the first systematic evaluations of the impact of the 2009 influenza A(H1N1) pandemic on public health services. The low level of anxiety of public health workers about becoming infected with the influenza A(H1N1)2009 virus is in stark contrast to that reported during outbreaks of other infectious diseases, such as severe acute respiratory syndrome (SARS) [9,14-18] and the degree of anxiety experienced by the public during the first months of the 2009 influenza A(H1N1) pandemic in the Netherlands [19]. The low level of anxiety in our study may be explained by the fact that the course of illness in the pandemic was mild [5]. This knowledge, which became increasingly clear during the pandemic, might have influenced the health workers' perception of their own health risks and thus might have diminished any anxiety and stress. It has been reported in studies mainly involving experience with SARS that several factors were associated with

FIGURE

Perceived workload of questionnaire respondents during 29 April to 15 August 2009, Netherlands (n=166)

TABLE 2

Compliance of questionnaire respondents with control measures during 29 April to 15 August 2009, Netherlands (n=166)^a

Compliance with control measures	Percentage of respondents ^b	Number of respondents
Applying case definition (n=166)		
Strictly followed	66	110
Sometimes followed	30	50
Did not know	4	6
Centralised assessment (n=141)		
Always	40	56
Only at the beginning of the pandemic	48	68
Sometimes	10	14
Never	2	3
Use of personal protective equipment (n=145)		
Always	88	128
Regularly	10	15
Sometimes	1	2
Informing patients and contacts about isolation measures ^c		
Wearing a mask indoors (n=121)	71	86
Social distancing (n=156)	99	154
Not leaving home (n=149)	95	142
Additional information (n=149)	97	145

^a Unless otherwise indicated.

^b The percentages in some categories do not total 100% due to rounding.

^c Multiple responses possible.

anxiety, fear or psychological distress, such as direct contact with patients [14,20] and years of working experience [10]. However, in our study population, only having children in the household and having doubts about the effectiveness of the personal protective equipment had an effect on anxiety levels. Such associations have also been reported elsewhere [14,20]. However, we found no association between the length of work experience and the level of anxiety regarding infection.

Our study shows that during the first months of the pandemic, compliance with control measures was good. Confidence in the appropriateness of personal protective measures to reduce transmission can lower the level of anxiety, as was observed by Nickel *et al.* during the SARS outbreak [20]. We believe that confidence in the appropriateness of the personal protective measures further strengthened compliance of the respondents in our study, as Cabana *et al.* reported that having trust in recommended control measures makes a professional more likely to comply with control measures or to emphasise the importance of the measures to patients [21]. In our study, the majority of the surveyed health professionals used personal protective equipment for house visits, even though only a minority was concerned about getting infected. Interestingly, respondents who were less compliant had been working at a public health service for either less than one year or more than 10 years. Therefore, efforts to increase compliance should be focused primarily on these groups.

Previous studies have shown that, during the SARS outbreak, 53–66% of the healthcare workers had an increased workload [9,10,22]. Similarly, in our study, the workload was reported to be very high to extremely high. However, we are not able to compare the workload during the pandemic with that in the period before it, as workload has not been systematically assessed for these groups of professionals outside outbreak periods. The increased workload was partially due to carrying out tasks that normally do not belong to the regular work of public health services, such as systematic sampling of patients, and prescribing and distributing antiviral drugs, which are rather the domain of general practitioners and pharmacists. Given that the pandemic demanded prolonged exertion from most frontline public health workers, including tasks that required new skills, it is likely that the maximum response capacity of public health services was reached. Such a high workload could probably not have been maintained for a longer period of time and workload can therefore become an issue in future outbreaks of diseases with high severity and involving a high number of cases. Therefore, the importance of thorough preparedness plans needs to be emphasised. These plans should consider ways to increase numbers of staff at short notice.

In our study, although the level of anxiety about infection among the respondents was low during the pandemic, our results showed that confidence in the appropriateness of personal protective measures to reduce transmission can lower the level of anxiety. Thus preparedness plans should include strategies that increase the confidence of public health workers in infection control measures. Adequate and timely information on such measures has been reported to be a major factor affecting health professionals' confidence in them [23]. In the light of these findings, we support the view that information about the choice and rationale for infection control measures, together with the expected efficacy, should be made available to health professionals at the very beginning of a crisis or outbreak, to increase their confidence in the measures and thus reduce concerns about possible infection. Furthermore, new insights from research or daily practice should prompt timely adjustments of the measures to increase credibility and stimulate adherence.

We believe that our findings are applicable to other European countries with a similar structure of communicable disease control. A pandemic may be seen as the ultimate test for public health response capacity. Our study shows the importance of thorough preparedness for crisis situations due to infectious disease outbreaks and its implications extend beyond the 2009 influenza A(H1N1) pandemic. To the best of our knowledge, the impact of the 2009 pandemic on healthcare workers has not been previously investigated. However, an initial response of healthcare institutions regarding experiences, barriers and perceived future needs was studied by Lautenbach *et al.*, who concluded that revision of preparedness plans seems to be necessary, including items related to workload and education [24]. We also consider preparedness and planning for an optimal response and surge capacity an important subject of concern for the future, given the likelihood that severe outbreaks and communicable disease threats will occur again [25–29] and will be a serious burden on the public health system.

One limitation of our study is that data were collected nine months after the beginning of the 2009 pandemic and therefore could be subject to recall bias. A detailed timeline was displayed on the questionnaire, to aid the respondents' memory, but recall bias could lead, for example, to underestimation of the level of anxiety about becoming infected during the first months of the pandemic. Nevertheless, our results show that the pandemic had a substantial impact on the surveyed public health workers and that this was still felt nine months later.

A second aspect that should be considered is that in our study, the proportion of responders among the public health physicians was higher than the proportion of responders among the public health nurses. This is not surprising, considering the fact that in the Netherlands public health physicians carry final responsibility for

the management of public health issues and are more likely to consult the Preparedness and Response Unit than public health nurses would. Or it may be that the questionnaire was of greater interest to public health physicians than to public health nurses, as it dealt with issues regarding strategies used during outbreaks. Therefore, our results may be more applicable to public health physicians than to public health nurses.

In conclusion, during the pandemic, the frontline public health workers surveyed in the Netherlands showed they were able to accommodate a substantially increased workload, even though initially their assignments were unfamiliar.

Acknowledgements

We thank the frontline public health workers who participated in the in-depth interviews, the participants in the pilot study and all those who responded to the questionnaire. We are also grateful to Marlies Hulscher (Radboud University Nijmegen Medical Centre) and Marion Koopmans (RIVM) for their suggestions. This study was undertaken through a grant from the Dutch Research Foundation, ZonMw.

References

- World Health Organization (WHO). Swine influenza. Statement by WHO Director-General, Dr Margaret Chan. 25 April 2009. Available from: http://www.who.int/mediacentre/news/statements/2009/h1n1_20090425/en/index.html
- World Health Organization (WHO). World now at the start of 2009 influenza pandemic. Statement to the press by WHO Director-General Dr Margaret Chan. 11 June 2009. Available from: http://www.who.int/mediacentre/news/statements/2009/h1n1_pandemic_phase6_20090611/en/index.html
- Brienen NJC, Vriend HJ, van der Hoek W. Epidemiologische ontwikkelingen nieuwe influenza A (H1N1). [Epidemiological situation new influenza A (H1N1)]. Infectieziekten Bulletin. 2009;20(7):231-3. Dutch. Available from: http://www.rivm.nl/cib/publicaties/bulletin/jaargang_20/bull2007/epidemiologie.jsp
- European Commission. Commission Decision of 30 April 2009 amending Decision 2002/253/EC laying down case definitions for reporting communicable diseases to the Community network under Decision No 2119/98/EC of the European Parliament and of the Council. Official Journal of the European Union. L 110/58. 1.5.2009. Available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:110:0058:0059:EN:PDF>
- Preliminary analysis of influenza A(H1N1)v individual and aggregated case reports from EU and EFTA countries. Euro Surveill. 2009;14(23). pii: 19238. Available from: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19238>
- World Health Organization (WHO). Pandemic influenza preparedness and response: a WHO guidance document. Geneva: WHO; 2009. Available from: <http://www.who.int/csr/disease/influenza/PIPGuidance09.pdf>
- National Institute for Public Health and the Environment (RIVM). Nieuwe influenza A (H1N1), Overzicht 24 juni 2010, week 25. [New influenza A (H1N1), overview 24 June 2010, week 25]. 2010. Dutch. Available from: http://www.rivm.nl/cib/binaries/H1N1overzicht_24062010_tcm92-72132.pdf
- Porten K, Faensen D, Krause G. SARS outbreak in Germany 2003: workload of local health departments and their compliance in quarantine measures--implications for outbreak modeling and surge capacity? J Public Health Manag Pract. 2006;12(3):242-7.
- Koh D, Lim MK, Chia SE, Ko SM, Qian F, Ng V, et al. Risk perception and impact of Severe Acute Respiratory Syndrome (SARS) on work and personal lives of healthcare workers in Singapore: what can we learn? Med Care. 2005;43(7):676-82.
- Maunder RG, Lancee WJ, Rourke S, Hunter JJ, Goldbloom D, Balderson K, et al. Factors associated with the psychological impact of severe acute respiratory syndrome on nurses and other hospital workers in Toronto. Psychosom Med. 2004;66(6):938-42.
- Glezen WP. Emerging infections: pandemic influenza. Epidemiol Rev. 1996;18(1):64-76.
- FNVBondgenoten. Werkdruk in het MKB: een groot probleem in een klein bedrijf. [Workload in SME: a large problem in a small business]. Utrecht: FNVBondgenoten. [Accessed 22 Jul 2010]. Dutch. Available from: <http://www.arbobondgenoten.nl/bondarbo/uitgaven/werkdrukprobleem.htm>
- Centraal Bureau voor de Statistiek/Statline. Gebieden in Nederland 1999. [Municipalities in the Netherlands 1999]. [Accessed 22 Jul 2010]. Dutch. Available from: <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=7427PCR&D1=1,61-65&D2=a&HDR=T&STB=G1&VW=T>
- Grace SL, Hershenfield K, Robertson E, Stewart DE. The occupational and psychosocial impact of SARS on academic physicians in three affected hospitals. Psychosomatics. 2005;46(5):385-91.
- Imai T, Takahashi K, Hasegawa N, Lim MK, Koh D. SARS risk perceptions in healthcare workers, Japan. Emerg Infect Dis. 2005;11(3):404-10.
- Styra R, Hawryluck L, Robinson S, Kasapinovic S, Fones C, Gold WL. Impact on health care workers employed in high-risk areas during the Toronto SARS outbreak. J Psychosom Res. 2008;64(2):177-83.
- Hawryluck L, Lapinsky SE, Stewart TE. Clinical review: SARS - lessons in disaster management. Crit Care. 2005;9(4):384-9.
- Reynolds DL, Garay JR, Deamond SL, Moran MK, Gold W, Styra R. Understanding, compliance and psychological impact of the SARS quarantine experience. Epidemiol Infect. 2008;136(7):997-1007.
- Bults M, Beaujean DJ, de Zwart O, Kok G, van Empelen P, van Steenbergen JE, et al. [Mexican flu: risk perception in the general public, precautionary measures and trust in information provided by the government]. Ned Tijdschr Geneesk. 2010;154:A1686. Dutch.
- Nickell LA, Crighton EJ, Tracy CS, Al-Enazy H, Bolaji Y, Hanjrah S, et al. Psychosocial effects of SARS on hospital staff: survey of a large tertiary care institution. Cmaj. 2004 Mar 2;170(5):793-8.
- Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PA, et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. JAMA. 1999;282(15):1458-65.
- Bergeron SM, Cameron S, Armstrong-Stassen M, Pare K. Diverse implications of a national health crisis: A qualitative exploration of community nurses' SARS experiences. Can J Nurs Res. 2006;38(2):42-54.
- Timen A, Hulscher ME, Rust L, van Steenbergen JE, Akkermans RP, Grol RP, et al. Barriers to implementing infection prevention and control guidelines during crises: experiences of health care professionals. Am J Infect Control. 2010;38(9):726-33.
- Lautenbach E, Saint S, Henderson DK, Harris AD. Initial response of health care institutions to emergence of H1N1 influenza: experiences, obstacles, and perceived future needs. Clin Infect Dis. 2010;50(4):523-7.
- Fauci AS. Infectious diseases: considerations for the 21st century. Clin Infect Dis. 2001;32(5):675-85.
- Fauci AS. Emerging infectious diseases: a clear and present danger to humanity. JAMA. 2004;292(15):1887-8.
- Fauci AS, Touchette NA, Folkers GK. Emerging infectious diseases: a 10-year perspective from the National Institute of Allergy and Infectious Diseases. Emerg Infect Dis. 2005;11(4):519-25.
- Morens DM, Folkers GK, Fauci AS. The challenge of emerging and re-emerging infectious diseases. Nature. 2004;430(6996):242-9.
- Morens DM, Folkers GK, Fauci AS. Emerging infections: a perpetual challenge. Lancet Infect Dis. 2008;8(11):710-9.