THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

Lack of concordance between ECDC and CDC systems for surveillance of ventilator associated pneumonia

Citation for published version:

Craven, T, Wojcik, G, McCoubrey, J, Brooks, O, Grant, E, Reilly, J, Laurenson, IF, Kefala, K & Walsh, T 2018, 'Lack of concordance between ECDC and CDC systems for surveillance of ventilator associated pneumonia', *Intensive Care Medicine*, vol. 44, no. 2, pp. 265. <https://doi.org/10.1007/s00134-017-4993-8>

Digital Object Identifier (DOI):

[10.1007/s00134-017-4993-8](https://doi.org/10.1007/s00134-017-4993-8)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Intensive Care Medicine

Publisher Rights Statement:

The is the Author's Peer Reviewed version as accepted for publication.

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Intensive Care Medicine

Lack of concordance between ECDC and CDC systems for surveillance ventilator associated pneumonia --Manuscript Draft--

Manuscript Number:	ICME-D-17-01228R3	
Full Title:	Lack of concordance between ECDC and CDC systems for surveillance ventilator associated pneumonia	
Article Type:	Letter	
Funding Information:	The Scottish Government	Prof Timothy S Walsh
Corresponding Author:	Thomas Craven, PhD, MB BChir University of Edinburgh UNITED KINGDOM	
Corresponding Author Secondary Information:		
Corresponding Author's Institution:	University of Edinburgh	
Corresponding Author's Secondary Institution:		
First Author:	Thomas H Craven	
First Author Secondary Information:		
Order of Authors:	Thomas H Craven Gosha Wojcik Jodie McCoubrey Odette Brooks Esther Grant Jacqui Reilly Ian F Laurenson Kallirroï Kefala Timothy S Walsh	
Order of Authors Secondary Information:		
Author Comments:	Each surveillance algorithm uses different methods to get to the same result: identification of genuine VAP. If the two methods show no concordance, that is an important result.	
Response to Reviewers:	<p>thank you for the effort ,</p> <p>still minor changes to make a figure only and suppress the table 1 (mandatory++)</p> <p>I suggest to start at the upper part of the figure with a flow diagram ---> in the middle an array with the number (%) of concordant diagnoses , and 2 other arrays: with on the left n (%)ECDC+ CDC - , on the right n (%) CDC-ECDC+ followed by the figure as is appeared in the R2 version.</p> <p>also : in the figure the legend "Sustained deterioration in oxygenation without systemic features of infection (No IVAC)" did not refer to any cases. could you please check and delete it if there is no case with this definition?</p> <p>Thank you for your continued review. The requested changes have been incorporated into the resubmitted version. Thanks and best wishes.</p>	

[Click here to view linked References](#)

Lack of concordance between ECDC and CDC systems for surveillance of ventilator associated pneumonia.

1 Thomas H Craven^{a,b,d}

2 Gosha Wojcik^b

3 Jodie McCoubrey^c

4 Odette Brooks^d

5 Esther Grant^e

6 Jacqui Reilly^c

7 Ian F Laurenson^d

8 Kallirroi Kefala^{a,b,d}

9 Timothy S Walsh^{a,b,d}

^a Centre for Inflammation Research, University of Edinburgh, UK

^b Edinburgh Critical Care Research Group, University of Edinburgh, UK

^c Health Protection Scotland, UK

^d Royal Infirmary of Edinburgh, UK

^e Western General Hospital, UK

Conception and design: THC, GW, JM, JR, IFL, KK, TSW

Analysis and interpretation: THC, GW, JM, OB, EG, TSW

Drafting the manuscript for important intellectual content: THC, JM, JR, TSW

1 Ventilator-associated pneumonia (VAP) refers to inflammation of the lung
2 parenchyma caused by an infectious agent acquired during invasive mechanical
3 ventilation. The criteria used to define VAP are the subject of ongoing controversy
4 and there remains no universally agreed international definition, at least in part
5 accounting for the wide range of reported incidence [1]. Despite this, surveillance and
6 public reporting for VAP is advocated by legislatures, accreditation agencies, and
7 consumer organizations because it is viewed as a preventable complication with
8 attributable morbidity and mortality [2].
9
10
11
12
13
14
15

16 In Europe the European Centre for Disease Control (ECDC) definitions are used [3].
17 Subjective chest x-ray interpretation and pulmonary symptoms are combined with
18 objective systemic features of infection with or without supporting microbiological
19 data (supplemental table 1). In contrast, the Centre for Disease Control (CDC) in the
20 USA employs an algorithm designed to be entirely objective, developed and
21 extensively evaluated with the aim of decreasing variation attributable to subjective
22 interpretation [4]. It returns a hierarchical diagnosis culminating in probable VAP,
23 triggered by a sustained deterioration in oxygenation after stability plus objective
24 systemic features with mandatory supportive microbiology (supplemental table 2).
25 We carried out a 12-month regional comparison of the surveillance definitions and
26 posed the following research questions: what is the incidence of VAP when
27 ascertained by ECDC or CDC definitions and what is the concordance between
28 ECDC and CDC surveillance definitions?
29
30
31
32
33
34
35
36
37
38
39
40
41

42 We performed an observational study of all consecutive admissions to two large adult
43 intensive care units in Edinburgh, UK. The data protection guardian approved the
44 study; as a service evaluation ethics committee approval was not required. Two
45 independent teams carried out each surveillance algorithm separately (more
46 information available in the supplemental material). Concordant events between
47 different algorithms were defined as those occurring not more than two calendar days
48 either side of the day of diagnosis. Concordance was quantified using Cohen's kappa.
49
50
51
52
53
54
55

56 Between 1st June 2015 and 31st May 2016, we enrolled 1,240 sequential admissions
57 who stayed longer than two calendar days. 713 (57.5%) were mechanically ventilated
58 for more than two calendar days and formed our at-risk population for VAP as well as
59
60
61
62
63
64
65

providing the denominator for total ventilation days. Overall, the VAP rates per 1000 ventilation days ($\pm 95\%$ confidence interval) were very similar (ECDC 5.4 (3.8-7.5), CDC 4.6 (3.1-6.6)). However, events diagnosed as VAP with the two surveillance definitions were almost completely discordant (Cohen's kappa 0.082 (95% CI: -0.034 to 0.191)). Reasons for discordance are shown in figure 1.

The recommended methods for VAP surveillance in Europe (ECDC) and the US (CDC) use different case definitions to identify VAP for surveillance to inform quality improvement and infection prevention. They report similar population-level rates of VAP but with almost no concordance among VAP events, predominantly due to either the absence of a sustained deterioration in oxygenation after stability or absence of relevant x-ray changes. These data suggest caution in comparing rates reported using different surveillance systems, and remind us these definitions should not be used to identify true VAP events in individual patients.

Figure 1 – Examination of discordance between surveillance definitions.

Flow chart illustrates each permutation of surveillance with ECDC and CDC systems with total number of patients (%). If a VAP event was triggered by one definition, the absence of a VAP event defined using the other definition within a five-day window centered on the trigger date was defined as discordance. Inset graphs: Top bar – proportion of events where the attending clinician initiated a course of antibiotics to

treat suspected VAP. Bottom bar – Reasons for not progressing to VAP via the alternate surveillance definition. Bars refer only to events within five-day window of VAP trigger date. VAC – ventilator-associated complication, PVAP – probable ventilator-associated pneumonia.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

References

1. Kalanuria AA, Zai W, Mirski M (2014) Ventilator-associated pneumonia in the ICU. Crit Care 18:208. doi: 10.1186/cc13775
2. Klompas M, Khan Y, Kleinman K, et al (2011) Multicenter Evaluation of a Novel Surveillance Paradigm for Complications of Mechanical Ventilation. PLoS One 6:e18062. doi: 10.1371/journal.pone.0018062
3. European Centre for Disease Prevention and Control. European surveillance of healthcare-associated infections in intensive care units – HAI-Net ICU protocol, version 1.02. Stockholm: ECDC, 2015.
<https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/healthcare-associated-infections-HAI-ICU-protocol.pdf>. Accessed 25 Sep 2017
4. Magill SS, Klompas M, Balk R, et al (2013) Developing a new, national approach to surveillance for ventilator-associated events. Am J Crit Care 22:469–73. doi: 10.4037/ajcc2013893

Acknowledgements: Funding was provided by The Scottish Government.

[Click here to access/download](#)

Supplementary Material

ICM VAP research letter resubmission SM
02Oct2017.docx