Measles: how many hospitalised cases are we missing?

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Abstract

We aimed to determine whether the Victorian measles surveillance system had missed hospitalised cases of measles during an inter-epidemic period. We searched the Victorian Inpatient Minimum Dataset (VIMD) for the period 1 January 1997 to 30 June 1998 to identify patients with ICD-9 discharge codes for measles (055). The data were compared with that held in the Victorian measles surveillance dataset. The hospital case notes of patients identified in the VIMD but not in the measles surveillance dataset were reviewed systematically to determine whether the patients met case definitions for laboratory-confirmed or clinically compatible measles. Sixteen admissions (15 patients) were identified with a measles ICD-9 code. Eight patients were not identified in the measles surveillance dataset. Of these, one was a laboratory confirmed case of measles and two met a clinical case definition but all should have been notified to the Department of Human Services as suspected cases. While the small number of missed notifications is encouraging in terms of overall measles surveillance, it highlights important deficiencies in the awareness of hospital staff of their role in the control of measles, particularly as Australia moves towards the elimination of measles. *Commun Dis Intell* 2001;25:137-140.

Key words: hospitals, surveillance, eradication, ICD-9, measles

Introduction

Australia has moved to the elimination phase of measles eradication to arrest indigenous transmission of the virus.[1,2] Surveillance and laboratory confirmation of measles are increasingly important as incidence declines.[3]

In Victoria, measles is notifiable by both clinicians and laboratories within 24 hours of a presumptive diagnosis. In 1997, the Department of Human Services (DHS) and the Victorian Infectious Diseases Reference Laboratory (VIDRL) implemented a system of enhanced surveillance.[4,5] This has ensured that each measles notification is dealt with in a uniform manner and has greatly improved the proportion of cases who have laboratory tests performed. It does not however, provide any information about cases of measles that are not notified.

One method of assessing the ability of measles surveillance to detect all cases in the community is to review other surveillance datasets that collect information about measles cases. The Victorian Inpatient Minimum Dataset (VIMD) contains ICD-9 discharge codes for all hospital separations in Victoria. We used the VIMD to identify ICD-9 discharge codes that indicated measles as a contributory cause of the hospital admission. The major aim of the study was to assess whether the surveillance system had missed hospitalised cases of measles during an interepidemic period.

Methods

Case definitions

Case definitions for measles were those used in Victoria in the enhanced measles surveillance program.[2,4]

A laboratory-confirmed case was defined as a person who met one of the following criteria: a positive test for measles-specific IgM, or a four-fold rise in measles antibody titre in paired acute and convalescent sera, or isolation of measles virus from a clinical specimen, or a positive measles-specific PCR test of a clinical specimen.

A clinically compatible case was defined as a person with a morbilliform rash, cough and fever present at the time of rash onset who was not laboratory confirmed, because either no specimen was collected or blood was collected too early after the appearance of the rash (less than 72 hours).[6] Additional signs and symptoms consistent with a diagnosis of measles may also have been present including coryza, conjunctivitis and Koplik spots on the oral mucosa.

Data sources and analyses

The VIMD for the period 1 January 1997 to 30 June 1998 was searched to identify patients with an ICD-9 code for measles (055) as the principal or other level diagnosis. Details from the VIMD were cross-matched with the Victorian enhanced measles surveillance dataset to determine whether hospitalised cases had been notified. The surveillance database contained details of all notified cases of suspected and confirmed measles. There was no unique identifier present in both databases. The fields used for cross-matching were: age or date of birth, geographical

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proximity of notification address and hospital address, and relationship between the onset and notification dates recorded in the measles surveillance dataset and the hospital admission and separation dates recorded in the VIMD.

Ethics approval to review the patients' hospital records was obtained from the Department of Human Services' Ethics Committee. With each hospital's approval, we reviewed the records systematically and collected information about the clinical features of the illness, laboratory testing for measles and whether measles was mentioned as a diagnosis.

Results

Sixteen hospital admissions with ICD-9 codes for measles were identified in the VIMD between 1 January 1997 and 30 June 1998 (Figure).

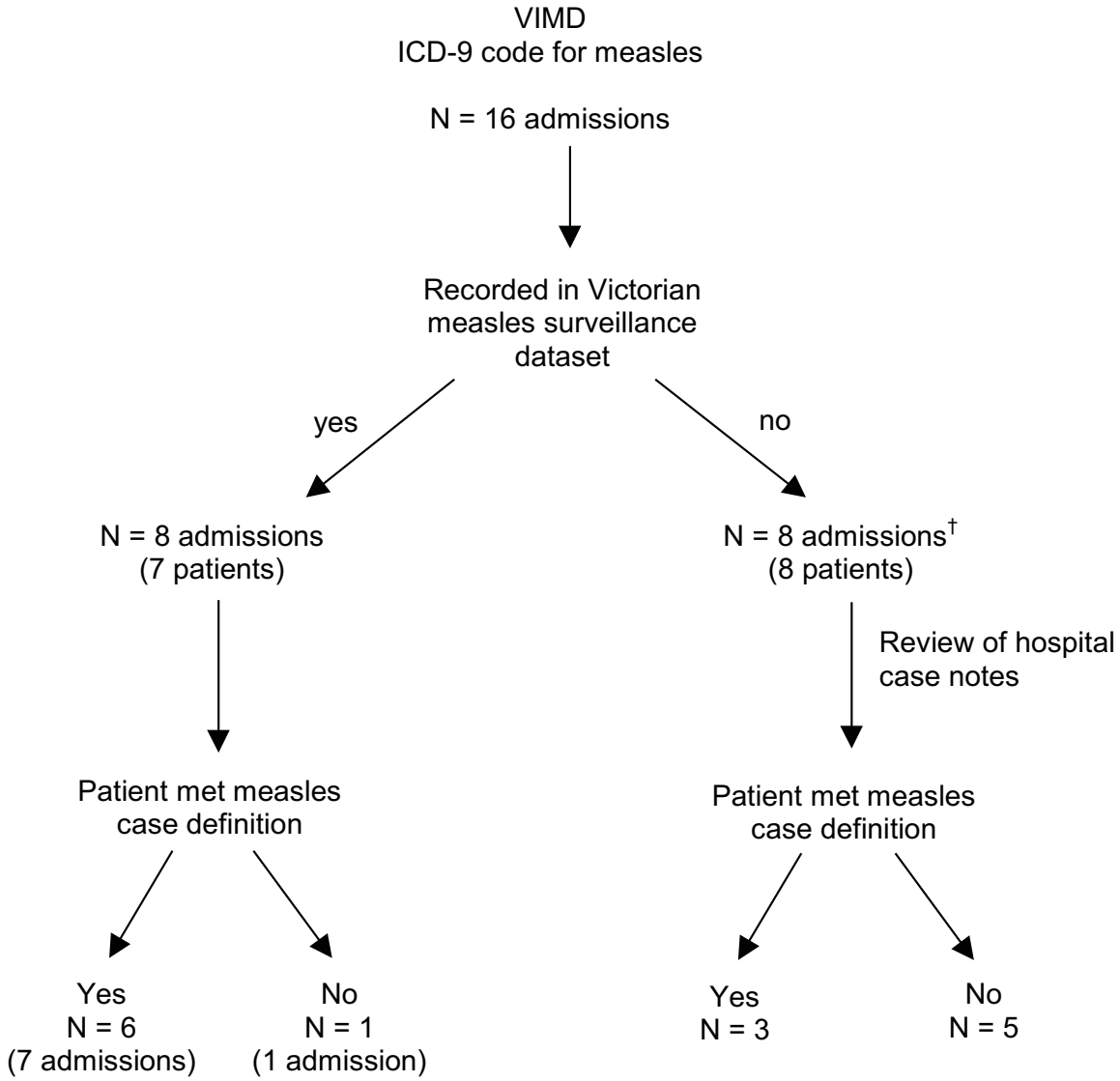
Patients reported in Victorian measles surveillance dataset

Notification records were identified in the measles surveillance dataset for 8 of the admissions, which corresponded to 7 patients (one person appeared twice in the VIMD with 2 different UR numbers). Six of these 7 patients were recorded as laboratory confirmed measles cases in the measles surveillance dataset. The seventh patient was recorded as 'laboratory rejected' because measles serology, performed at least 72 hours after the appearance of the rash, was IgM negative.

Patients not reported in Victorian measles surveillance dataset

The case notes were reviewed for each of the 8 patients who were identified in the VIMD but not in the measles surveillance dataset. The data are summarised in the Table. All had a history of fever and rash recorded in their hospital

Figure. Flow diagram of hospital admissions identified in the VIMD with an ICD-9 code for measles for the period 1 January 1997 to 30 June 1998. *



* Admissions are grouped by whether the patient was recorded in the Victorian measles surveillance dataset, and whether they met a case definition for either laboratory-confirmed or clinically-compatible measles.

† Further described in the Table.

admission notes. The ages of the patients ranged from 8 months to 24 years.

Patients 1, 2 and 3, all aged 8 months, were the only 3 of the 8 patients who met case definitions of laboratory confirmed or clinically compatible measles (Table). All 3 should have been notified as presumptive cases of measles under the Infectious Diseases Regulations of the Victoria Health Act. Patient 1 had IgM positive measles serology. There was no record of laboratory testing for measles for Patient 2, although at the time of discharge, the paediatric registrar noted that measles was the probable diagnosis. Patient 3 had a provisional diagnosis of measles recorded in the hospital notes and measles serology was performed. However the specimen, taken less than 48 hours after the appearance of rash, was negative for measles IgM and there was no evidence that repeat serology was performed.

Patient 4 was admitted to a hospital emergency department 'mildly febrile' and with a mild rash on her trunk. The medical officer recorded '?Impr: Measles' in the patient's case notes as one of several diagnoses considered at the initial medical examination. The patient was discharged after 4 hours. There was no evidence that the child met a clinical or laboratory definition of measles. The ICD-9 coding for measles appeared to have arisen from the initial notation used by the medical officer.

Patients 5, 6 and 7 were all young boys who were hospitalised with cellulitis and infected wounds following accidents (swimming, burns and skate boarding). All were given intravenous antibiotics and wound swabs from Patients 6 and 7 grew *Staphylococcus aureus*. All were febrile and had rashes that appear likely to have been related to either their infection or antibiotic treatments. None met case definitions for measles. It appears that nursing and medical notations of 'morbilliform rash' and 'measles-like rash' led to ICD-9 codes for measles being recorded for each of these patients.

Patient 8 was hospitalised with a rash and developed a fever 2 days after admission. The only mention of measles in the hospital records was in the discharge summary.

Summary

In summary, between 1 January 1997 and 30 June 1998, the Victorian measles surveillance system detected 7 hospital admissions (6 patients) who met laboratory confirmed or clinically compatible measles, but missed another three. During the same period, 21 laboratory confirmed and 17 clinically compatible cases were detected through surveillance. A further 251 suspected cases of measles were notified that, when investigated, did not meet laboratory or clinical case definitions.

Discussion

For the 18-month period analysed, the Victorian measles surveillance system detected 6 of 9 of hospitalised cases of measles identified from the VIMD. During this same period, measles transmission appears to have been interrupted, and an endemic strain was not circulating.[5,7] Five hospital admissions coded as measles in the VIMD are highly likely not to have been measles but appear to have been coded incorrectly through misinterpretation of the medical or nursing case notes or lack of more specific information in the notes. It is possible that hospitalised cases of measles were

Table. Summary of clinical and laboratory results for 8 patients with ICD-9 codes for measles in the VIMD, 1 January 1997 to 30 June 1998

Patient No.	Age	Max temp C	Rash	Rash duration (days)	Fever before rash	Cough	Coryza	Conjunctivitis	MMR vaccine	Serology result	Comment
1	8 m	39.2	+	NR	NR	-	+	+	NR	IgM pos	Laboratory confirmed
2	8 m	40.3	+	>3	+	+	+	NR	NR	NR	Clinically compatible
3	8 m	39.0	+	>3	+	+	+	+	NR	IgM neg*	Clinically compatible†
4	5 y	mild	+	NR	NR	NR	NR	NR	NR	NR	Not measles
5	5 y	37.7	+	NR	NR	+	+	NR	+	NR	Not measles
6	8 y	39.0	+	NR	-	+	NR	NR	NR	NR	Not measles
7	12 y	39.9	+	NR	NR	NR	NR	NR	NR	NR	Not measles
8	24 y	38.4	+	>3	-	NR	NR	NR	NR	NR	Not measles

\+ Present
\- Absent
NR Not recorded
* Serology performed less than 72 hours after the appearance of the rash
† Hospital records noted the appearance of 'white spots' on the oral mucosa, possibly Koplik spots

not detected in our study due to incorrect diagnosis or ICD-9 coding.

Reasons that hospital personnel did not notify the 3 cases identified in the study may include a lack of awareness among hospital medical staff of their obligation under the infectious diseases regulations and their role in the control of this highly infectious disease.[8] This has important implications in terms of measles control and surveillance as Australia moves towards elimination of measles and highlights the potential for measles transmission in health settings. Hospital inpatients in paediatric units pose an important risk group, since they may be unimmunised due to their age and/or be immunocompromised.

In the 1999 measles outbreak in Victoria, 37 per cent of cases were hospitalised.[9] At least 4 health workers became infected through patient contact, and 2 others were probably infected through indirect contact in health settings. Recently in Queensland, lack of awareness by hospital staff of measles control and prevention measures, resulted in an extended investigation to trace people who were present in an emergency department waiting room at the same time as several laboratory confirmed measles cases.[10] Our study provides further evidence of the need for education of hospital and other health professionals about the control of measles transmission in hospital and medical settings in Australia, including the importance of notifying suspected cases to public health authorities.

In conclusion, the results of the study are encouraging in terms of overall measles surveillance in Victoria but highlight some important issues in the era of elimination. These include the need to raise awareness among medical personnel of their role in the control of measles in the population, the importance of *appropriate* timing and methods of laboratory testing to confirm the diagnosis, and the lack of reliability of both clinical diagnosis and discharge coding in identifying cases of measles in health care settings.

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