Evaluation of the hepatitis B enhanced surveillance system in Ireland

Abstract

Background

Enhanced surveillance for hepatitis B cases in Ireland was established in 2005. It geographically covers all eight health service executive regions and is part of the electronic national notifiable infectious disease surveillance system, CIDR. We aimed to evaluate the surveillance system to identify if it fulfilled its objectives and to evaluate: completeness, timeliness, representativeness, acceptability and simplicity, identified by the surveillance team as important attributes.

Methods

We extracted electronic information on all notified hepatitis B cases from 2012 to 2016 to evaluate data quality and timeliness (acute cases only). We used published sero-prevalence studies and census data to estimate the expected number of cases in Ireland, and an on-line questionnaire was distributed to stakeholders to evaluate the simplicity and acceptability of the system.

Results

The system differentiates between acute and chronic cases with 97% of cases assigned appropriate disease status. Data completeness for chosen variables was better for acute cases (71%-95%) compared with chronic (32%-62%). Only 33% of acute cases were notified to the system within four days of laboratory result date while 29% had incorrect dates reported. Approximately 50%-57% of the expected number of hepatitis B cases was reported to the system. The majority of questionnaire respondents found the system acceptable (n=46, 90%) and easy to use (n=35, 69%), but suggested matching paper enhanced surveillance information exactly to electronic hepatitis B surveillance fields, having fewer fields to complete and removing duplicate fields.

Conclusions

The hepatitis B surveillance system, while comprehensive, does not fulfil all of its objectives. We recommend improved timeliness of reporting for acute cases, better data collection for chronic cases, implementation of existing hepatitis B screening guidance to ensure that notified cases are representative of hepatitis B in Ireland and streamlining the system as suggested by stakeholders.

Introduction

Public health surveillance has been described as the ongoing, systematic collection, analysis, interpretation and dissemination of data regarding the health-related event for use in public health action to reduce morbidity and mortality and to improve health[1]. Public health surveillance systems have a number of core functions including: case detection, registration and confirmation, data analysis and interpretation, epidemic preparedness, response and control and feedback.

Hepatitis B is a viral infection of the liver. It has an incubation period of 40 to 160 days[2]. Symptoms in the acute phase can include fever, malaise, nausea, vomiting, abdominal pain and jaundice. Less than 10% of children and 30-50% of adults develop symptoms when they are first infected[3]. Humans are the only reservoir[2]. Transmission is via blood or other bodily fluids from an infected person to a non-immune person. A proportion of people who contract hepatitis B will clear the infection from their system. However, 80-90% of infants who contract hepatitis B in their first year of life, 30-50% of children who contract hepatitis B before the age of six years and approximately 5% of adults who contract hepatitis B as an adult will develop chronic hepatitis B[4]. Those who develop chronic hepatitis B are at increased risk of cirrhosis of the liver and hepatocellular carcinoma[3]. A safe and effective hepatitis B vaccine is available[5].

Under Infectious Diseases Regulations 1981 medical practitioners must notify the Medical Officer of Health of all cases and suspected cases of hepatitis B[6]. An amendment to the regulations implemented at the beginning of 2004 (S.I. 707 of 2003) introduced case definitions and differentiated between notifications of acute hepatitis B and chronic hepatitis B[7]. In addition, laboratory directors have been required to report cases of notifiable diseases identified in their laboratories since 2004. The current electronic national notifiable infectious disease surveillance system, Computerised Infectious Disease Reporting (CIDR), has been in place in Ireland since 2004. CIDR is a central repository for all notifiable infectious diseases in Ireland. It is a shared national information system for CIDR partners which include: regional departments of public health, the national surveillance centre (HPSC) and the Department of Health. The hepatitis B surveillance system is part of CIDR. Users of the system have different levels of access to the system, depending on their role and location. It has provided nationwide surveillance for hepatitis B since 2004 and enhanced surveillance for hepatitis B since 2005. The hepatitis B enhanced surveillance system is populated by; data provided by clinicians to the Departments of Public Health in the eight Health Service Executive (HSE) areas in Ireland, data provided by local microbiology laboratories throughout the country and by information from the National Virus Reference Laboratory (NVRL).

The Health Protection Surveillance Centre (HPSC) is Ireland's specialist national agency for surveillance of communicable diseases. Consequently it is responsible for the hepatitis B surveillance system at national level.

The World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC) and the European Centre for Disease Prevention and Control (ECDC) have all published guidance on surveillance system evaluation[1, 8, 9]. They agree that surveillance system evaluations should

- Engage stakeholders
- Describe the system
- Ensure it fulfils its objectives
- Evaluate the system by describing the system attributes
- Make recommendations and share findings

Reasons to evaluate a surveillance system include: to ensure the health event is still a priority, to ensure that the system continues to fulfil its purpose and to identify areas for improvement. International guidelines suggest that these evaluations should take place periodically or they can be triggered by events such as missed outbreaks, the addition of new components or a change in public health policy[1, 8, 9].

We aimed to evaluate the hepatitis B surveillance system 2012-2016 on CIDR by describing the system, examining if it fulfilled its objectives and evaluating important attributes. The literature suggests that, to perform a balanced evaluation, between five and ten attributes of the surveillance system should be evaluated[10]. While the use of a large number of attributes within the evaluation is ideal, resources were limited. We chose the following attributes to evaluate the hepatitis B surveillance system in Ireland: data quality/completeness, timeliness, simplicity, acceptability, representativeness.

Methods

The evaluation took place between November 2017 and May 2018. Following discussion with the hepatitis surveillance team, we limited our evaluation to the hepatitis B enhanced surveillance system using the five year period 2012-2016, with the exception of representativeness, when all hepatitis B cases in the surveillance system were included, and agreed on chosen attributes. We described the system and subsequently conducted a review of the system based on our chosen attributes.

Description of surveillance system

We described the hepatitis B surveillance system using the following headings[9]:

- Overall description
- Surveillance objectives
- Disease(s) under surveillance
- Type of surveillance system
- Population under surveillance
- Data sources and flow
- Geographical coverage
- Information to be reported
- Reporting format
- Data entry

Fulfilment of original objectives

The original objectives of the hepatitis B surveillance system are not documented. However, the hepatitis B surveillance system is part of the larger web-based CIDR system. We applied the following general objectives of CIDR:

- Collect information on notifiable diseases from regional Departments of Public Health, clinical laboratories and reference laboratories across the country in a single shared national database
- Provide near real time infectious disease surveillance notifications to CIDR users locally, regionally and nationally
- Facilitate early detection of outbreaks
- Allow appropriate public health action to be taken at local, regional and national level
- Enable reporting to international agencies such as ECDC and WHO

We also included the following additional objectives based on ECDC recommendations on hepatitis B and C surveillance[11].

- Estimate the burden of disease on the population
- Distinguish between different presentations (acute and chronic) hepatitis B
- Monitor trends of disease over time
- Identify health care acquired infections
- Identify cases and monitor prevalence in at risk groups so that targeted interventions can be developed and implemented

Review of certain attributes

We identified five attributes to evaluate within the hepatitis B surveillance system, namely:

- Data quality/completeness
- Timeliness
- Simplicity
- Acceptability
- Representativeness

Data quality/completeness

We reviewed the internal completeness of data. The following five non-mandatory fields on the hepatitis B surveillance system were examined for completeness:

- Hepatitis B status
- Country of birth
- Country of infection
- Most likely risk factor
- Reason for testing

We did not evaluate external completeness of the data as all cases on the surveillance system are laboratory confirmed cases. All laboratories are required under infectious disease legislation to notify their confirmed cases of hepatitis B to the Medical Officer of Health (MOH) based at the local Department of Public Health. Only on very rare occasions would laboratory confirmed case not be notified to the system, therefore external completeness of the data is likely.

Timeliness (acute hepatitis B cases only)

Timeliness was evaluated for acute hepatitis B cases only. The number of days (time interval) between key dates, CIDR lab results date and the event creation date was calculated for each acute case where the dates were available. Incorrect dates (negative time intervals) were excluded.

Simplicity & Acceptability

We developed a questionnaire for all users of the surveillance system. The purpose of the questionnaire was to evaluate the simplicity and acceptability of the system. The questionnaire was developed following consultation with a sample of multidisciplinary stakeholders who regularly used the system, identified in discussion with the hepatitis surveillance team. An electronic link to the questionnaire was included in an email that was distributed to those who use the hepatitis B surveillance system including:

- Local laboratory staff
    - Consultant Microbiologists
    - Scientists
- Local Department of Public Health staff
    - Administration staff
    - Surveillance Assistants
    - Surveillance Scientists
    - Infection Control Nurses
    - Senior Medical Officers
    - Specialist Registrars in Public Health Medicine
    - Specialists in Public Health Medicine
- Reference laboratory staff
    - Consultant Microbiologists
    - Scientists
- National surveillance centre staff
    - Specialist in Public Health Medicine
    - Surveillance Scientist

The questionnaire was developed using Demographix online software, was anonymous and contained 11 questions. Several question types were included; questions that required a yes/no answer, questions that required one answer only to be chosen, questions that had a five point answer scale and questions that required one answer from four possible answers (agree, disagree, don't know, not applicable). A final free

text answer allowed stakeholders to make suggestions on how to improve the acceptability and simplicity of the system. Two email reminders were sent one and two weeks after the initial request.

Representativeness

Cases notified to a surveillance system may be derived unevenly from the population under surveillance and may therefore not be representative of the events in the population in general. Acute hepatitis B cases are likely to be notified following presentation to health services with symptoms of hepatitis. Chronic cases are largely asymptomatic and most likely will be detected based on screening practices e.g. asylum centre screening, antenatal screening, healthcare worker screening and drug treatment centre screening.

To evaluate representativeness of the notified population we used hepatitis B surveillance data, country of birth of the Irish population and published prevalence rates of hepatitis B surface antigen in individual countries globally[12, 13]. To identify the Irish population break-down by country of birth we used 2011 Central Statistics Office (CSO) census data[14]. The CSO did not provide a complete list of countries to choose from on the census form; certain countries were grouped together in categories labelled 'other African countries', 'other Asian countries' etc. Where the country of birth was part of these categories, we used the average published HBsAg prevalence of the countries in each category.

For the Irish population born outside Ireland we applied published hepatitis B country prevalence rates to Irish Census 2011 data on country of birth. For those born in Ireland, three different Irish prevalence estimates (0.03%, 0.05% and 0.10%) were applied to census data, two from published studies (0.03%, 0.10%)[13,15] and a mid-range estimate. These estimates were also applied to the Irish population with unknown country of birth.

We used the complete CIDR system 2004-2017 to identify the total number of hepatitis B cases notified. We were aware that some of these may be duplicates, some may have subsequently cleared hepatitis B infection and some may have left Ireland. Using the above information we estimated the representativeness of the surveillance system, based on country of birth of the Irish population.

Data analysis

Hepatitis B data were exported from CIDR and analysed in Microsoft Excel 2010.

Results

Description of surveillance system

Overall description of the hepatitis B surveillance system

In Ireland, the current hepatitis B surveillance system is part of a larger electronic surveillance system for notifiable communicable diseases, CIDR. CIDR is an event based system; each event corresponds to a case of a notified infectious disease. Clinicians directly notify regional Departments of Public Health of cases of notifiable infectious diseases either by telephone, fax or post. Laboratory notifications are extracted from laboratory information management systems (LIMS) and uploaded directly to CIDR by laboratory personnel. All notifications (both clinical and laboratory) are reviewed by regional Department of Public Health staff and checked, using demographic information such as name, date of birth and address, to ensure that the case has not been notified previously. If the case has not been notified previously, an event is created on CIDR for that case by regional Department of Public Health staff. Several records may be linked to one event e.g. laboratory notification, clinical notification, updates of enhanced surveillance information. CIDR users have different access levels to CIDR data depending on their role and location. Regional Department of Public Health Staff have access to named patient data from their own region only. The national surveillance centre (HPSC) staff has access to anonymised data from all regions of the country.

Information collected on CIDR for each event includes a core dataset which is common to all diseases. This includes events details such as:

- Disease, organism, case classification, HSE area of notification; patient record fields including: name, address, date of birth, sex, ethnicity, country of birth; laboratory record fields including: date of notification, patient name, address, laboratory tests etc; clinical record fields including; patient type, clinical symptoms, hospital name, patient type, outcome.

In addition, hepatitis B enhanced surveillance information is collected by regional department of public health staff using paper enhanced surveillance forms and entered manually into the corresponding event in CIDR. Enhanced surveillance data collected for hepatitis B cases includes:

- Reason for screening, hepatitis B immunisation history, and risk exposures.

National public health guidance, prepared by the hepatitis sub-group of the Public Health Medicine Communicable Disease Group, identifies patients with acute hepatitis B and their contacts as the first priority for public health management of hepatitis B notifications[16]. A suggested priority listing for other hepatitis B notifications is also included in the guidance. In some regional departments of public health,

enhanced surveillance is only undertaken for cases of acute hepatitis B; therefore information on chronic cases can be limited.

Ireland uses the European Centre for Disease Prevention and Control (ECDC) case definition for hepatitis B which only includes confirmed cases, based on a positive result of at least one of the following laboratory markers or a combination of them;

- IgM hepatitis B core antibody (anti-HBc IgM)
- Hepatitis B surface antigen (HBsAg)
- Hepatitis B e antigen (HBeAg)
- Hepatitis B nucleic acid (HBV-DNA)

Therefore all hepatitis B cases on the hepatitis B surveillance system are laboratory confirmed cases. Differentiation is made between acute and chronic hepatitis B notifications as follows[17].

Acute hepatitis B notification

Detection of IgM antigen-specific antibody (anti-HBc IgM) ***or***
Detection of hepatitis surface antigen (HBsAg) and previous negative HBV markers less than six months ago ***or***
Detection of hepatitis B nucleic acid (HBV-DNA) and previous negative HBV markers less than six months ago

Any of the above *with or without* symptoms and signs of hepatitis.

Chronic hepatitis B notification

Detection of HBsAg or HBeAg or HBV-DNA ***and***
No detection of anti-HBc IgM (negative result) ***or***
Detection of HBsAg or HBeAg or HBV-DNA on two occasions that are six months apart.

Unknown

Any newly diagnosed case which cannot be classified in accordance with the above definition of acute or chronic infection.

Surveillance objectives

The hepatitis B surveillance system was evaluated to establish if it fulfilled the surveillance objectives of CIDR (as it is part of the CIDR system) and also if it fulfilled ECDC hepatitis surveillance objectives.

- Collect information on notifiable diseases from regional Departments of Public Health, clinical laboratories and reference laboratories across the country in a single shared national database. **Yes** – the CIDR surveillance system fulfils this objective. The CIDR surveillance system is described previously both in the introduction and earlier in the results section, under the heading 'Description of surveillance system'.
- Provide near real time infectious disease surveillance notifications to CIDR users locally, regionally and nationally. **Not fully** – time delays are seen between date of laboratory result and date of event creation. This may be due to a delay at laboratory level e.g. batch notifications from the laboratory to Departments of Public Health or at Department of Public Health level e.g. delay in event creation.
- Facilitate early detection of outbreaks**. Yes** – CIDR surveillance data are regularly reviewed both at regional level at Departments of Public Health and at national level at HPSC.
- Allow appropriate public health action to be taken at local, regional and national level. **Yes** – events on CIDR are reviewed on a continuous basis both at regional and national level.
- Enable reporting to international agencies such as ECDC and WHO. **Yes** – hepatitis B data is reported to ECDC through the TESSy system (18). Hepatitis B data is reported to WHO/UNICEF on an annual basis via the 'WHO Communicable Disease Annual Reporting Form'.
- Estimate the burden of disease in the population. **Not fully** - acute cases of hepatitis B are more likely to be symptomatic, attend medical care and therefore should be notified to the system. Chronic cases are mostly asymptomatic and may not be identified unless an individual attends a service where hepatitis B screening takes place e.g. asylum centre screening, antenatal screening, drug treatment clinic screening, healthcare worker screening
- Distinguish between different presentations (acute and chronic) hepatitis B. **Yes** - through agreed case definitions
- Monitor trends of disease over time. **Yes** – national surveillance, quarterly and annual report publications
- Identify health care acquired infections. **Yes** – enhanced surveillance includes fields on risk exposure. These include surgical procedure in past six month and receipt of blood or blood products. In addition for acute cases, risk exposures include: any hospital attendance or dental procedures in the past six months
- Identify cases and monitor prevalence in at risk groups so that targeted interventions can be developed and implemented. **Yes** –enhanced surveillance includes fields on reason for testing and risk exposure

Disease(s) under surveillance

Hepatitis B is the disease under surveillance. The surveillance system includes acute, chronic and hepatitis B cases of unknown status. All cases included in the surveillance system are laboratory confirmed based on ECDC case definitions.

Data sources and flow

Figure 1 describes the data sources and data flow of the hepatitis B surveillance system

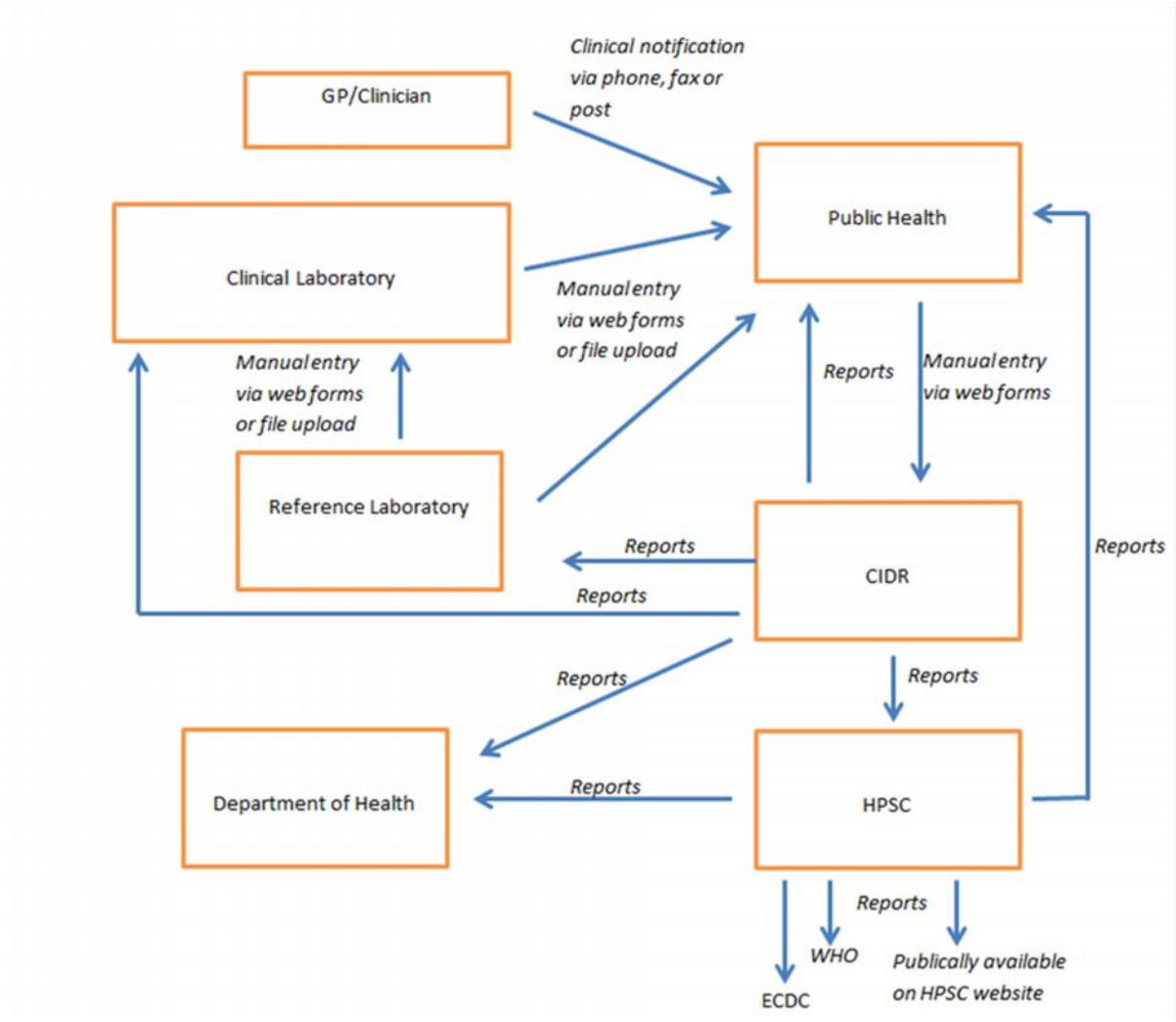

Figure 1. Data flow of hepatitis B surveillance system in Ireland

Since 2004 laboratory directors have been required to report cases of hepatitis B to the surveillance system. Laboratories electronically notify their cases to the CIDR system. Each local Department of Public Health then creates an event on CIDR for each newly notified case. Events are updated, by Department of Public Health staff, with additional surveillance information if available, collected from hospital and community based clinicians using enhanced surveillance forms. Laboratories may also refer cases for confirmatory testing at the NVRL, who will again notify the system of the result. It is usual for a single event to have several different records linked to it.

As all hepatitis B cases in the surveillance system are laboratory confirmed the local hospital-based microbiology laboratories nationally, as well as the National Virus Reference Laboratory are the data sources. General practitioners and hospital clinicians also notify confirmed cases to local public health departments. However, these are usually duplicates of previously notified laboratory cases.

Population under surveillance

The general population of Ireland is the population under surveillance. In addition, occasional cases are added to the surveillance system of people who were diagnosed with hepatitis B in Ireland but who are not ordinarily resident in Ireland.

Geographical coverage

The hepatitis B surveillance system is a national system and geographically covers all eight HSE areas of Ireland.

Type of surveillance

The hepatitis B surveillance system is a passive surveillance system, which relies on physicians and laboratory staff to report cases. Hepatitis B is a notifiable disease under the Infectious Diseases Regulations 1981 and reporting by physicians to the surveillance system is mandatory. A 2004 amendment to the legislation requires that laboratory directors report all cases of notifiable diseases identified in their laboratories. Therefore external completeness is likely within the system.

Information to be reported

The hepatitis B surveillance system is a case-based surveillance system. A common core set of variables is reported for all diseases in the CIDR system. In addition, an enhanced set of variables has been developed for most notifiable infectious diseases including hepatitis B. Variables in the system include; demographic details – date of birth, age, sex, address (to county level), HSE area, occupation, country of birth; risk factor

variables; disease status; reason for testing; patient type; laboratory variables – test results, date of diagnosis, laboratory details. Completion of the majority of variables is non-mandatory.

Reporting format

The hepatitis B surveillance system is part of the electronic surveillance system CIDR. Data is uploaded electronically from laboratories to the system. Enhanced surveillance information is collected by infection prevention control nurses, senior medical officers, specialists in public health medicine and specialist registrars in public health medicine at local Departments of Public Health. Clinicians are sometimes contacted by the local Dept. PH staff to request enhanced surveillance information. Enhanced surveillance information is usually collected on paper enhanced surveillance forms and subsequently transferred to the electronic surveillance system by Dept. of PH staff.

Data entry

CIDR is a web-based electronic system. Data entry to CIDR is explained in detail previously under the title 'Description of the surveillance system'.

Evaluation attributes

Data quality/completeness

Data completeness varied for the five non-mandatory fields selected:

- Hepatitis B status
- Country of birth
- Country of infection
- Risk factor
- Reason for testing

A total of 2,461 cases were recorded on CIDR during the 2012-2016. Hepatitis B status was complete for 97% of cases. Data were more complete in all five selected fields for acute hepatitis B cases than for chronic or unknown status cases (Table 1, Figure 2).

Table 1. Data completeness for five non-mandatory variables on the hepatitis B surveillance system in Ireland

	Data completeness			
	Number of cases that data is completed (percentage of total)			
	Overall surveillance system	Acute hepatitis B cases	Chronic hepatitis B cases	Unknown hepatitis B status
Hepatitis B status	2,461 (97.0)	154	2,232	75 (3.0)
Country of birth	1,274(51.8)	135(87.7)	1,120(50.2)	19(25.3)
Country of infection	834 (33.9)	110 (71.4)	717 (32.1)	7 (9.3)
Reason for testing	1551 (63.0)	146 (94.8)	1387(62.1)	18 (24.0)
Most likely risk factor identified	1,416(57.5)	144 (93.5)	1254 (56.2)	18 (24.0)

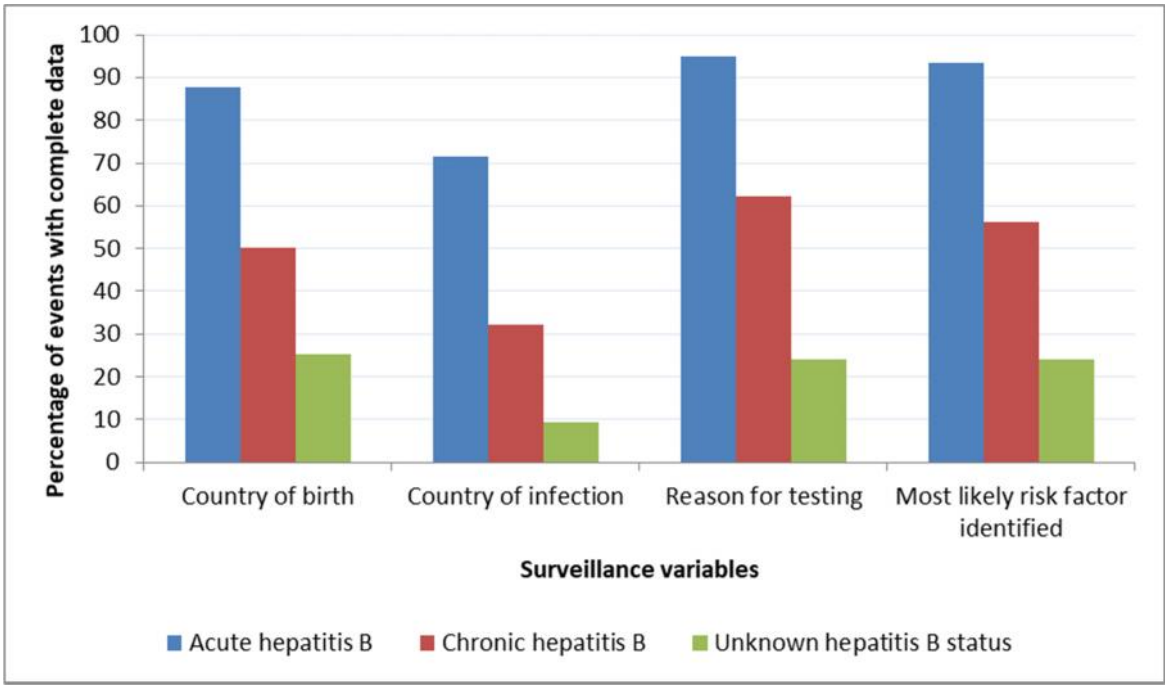

Figure 2. Data completeness for four surveillance variables by hepatitis B status in Ireland

Timeliness

Timeliness was evaluated for acute hepatitis B cases only. The indicator used was the time interval between CIDR lab result earliest date and the event creation date, measured in days. The time interval was calculated for 150 cases (97.4%) but 45 of these had a negative time interval and were therefore excluded. This resulted in 105 cases (68.2%) with a valid time interval. The median time interval between CIDR lab result earliest date and event creation date was 5 days (range 0-244 days).The time interval for over half of valid cases (61/105, 58.1%) was four days or less. Four days was chosen as the appropriate cut off point to ensure control measures such as immunoglobulin and hepatitis B vaccine could be given to contacts within the recommended seven days of exposure to an acute hepatitis B case.

Representativeness

The total number of notified hepatitis B cases on the CIDR hepatitis B surveillance system) 2004-2016 was 10,496. The estimated hepatitis B prevalence rates for Ireland using 2011 census data ranged from 0.42% to 0.48%. (Table 2)

Table 2. Estimated prevalence rate of hepatitis B and expected number of cases in Ireland

Prevalence estimates for Irish born and unknown country of birth	Expected number of Irish born and unknown country of birth cases	Expected number of born outside of Ireland cases	Expected total number of cases	HBsAg* positive prevalence rate
0.03	1,146	17,974	19,120	0.42%
0.05	1,911	17,974	19,885	0.43%
0.10	3,821	17,974	21,795	0.48%

*hepatitis B surface antigen

Using these prevalence rates, the expected number of hepatitis B cases in Ireland should be between 19,120 and 21,795 (Table 2). These results suggest that 48-55% of hepatitis B cases in Ireland are notified to the surveillance system.

Simplicity and acceptability

We received 60 responses to the questionnaire. A complete list of stakeholders was not available but we estimated the number of stakeholders to be approximately 90, based on staffing levels. Four responses were blank and were excluded. Five responses answered no to the question "Do you use the hepatitis B surveillance system?" and did not complete the questionnaire. These were also excluded, resulting in 51 valid responses, an estimated response rate of 55.6%. The majority of the respondents worked at regional departments of public health (n=42, 82.4%, Table 3). A variety of stakeholders completed the questionnaire with surveillance scientists the most common respondents (n=18, 35.4%). The most common reason for accessing the hepatitis B surveillance system was to examine individual events on the system (n=26, 51.0%, Table 3). Stakeholders accessed the system most frequently on a weekly occasion (n=18, 35.4%). Most respondents found the hepatitis B surveillance system acceptable to use (n=46, 90.2%) and the majority (n=35, 68.6%) found it very easy or easy to use.

Table 3. Questionnaire respondents work location, role and reason to use the hepatitis B surveillance system

		N=	%
Work location	Department of Public Health	42	82.4
	Hospital laboratory & National Virus Reference Laboratory	7	13.8
	Health Protection Surveillance Centre	2	3.9
Role	Surveillance Scientist		
	Department of Public Health	11	21.6
	Hospital laboratory	6	11.8
	NVRL	1	2.0
	Senior Medical Officer	9	17.6
	Specialist in Public Health Medicine	9	17.6
	Administrator	6	11.8
	Nurse	4	7.8
	Specialist Registrar in Public Health Medicine	3	5.9
	Surveillance Assistant	1	2.0
	Researcher	1	2.0
Reason to use hepatitis B surveillance system (more than one could be selected)	Examine individual events(cases)	26	51.0
	Add updates to existing events	25	49.0
	Add enhanced surveillance information	25	49.0
	Run reports	21	41.2
	Data validation	18	35.3
	Create new events	16	31.4
	Input laboratory data on LIMS*/extract LIMS data to export to CIDR	5	9.8
	View line listing only	1	2.0
	Other	1	2.0

*LIMS laboratory information management system

Examined individual events

Twenty-six respondents reported examining individual events on CIDR. However, when asked in a second question if they examined individual events, nine additional respondents replied yes bringing the total to 34 respondents. A variety of stakeholders in regional Departments of Public Health examined individual events. The majority (n=25, 73.5%) agreed that examining individual cases on the hepatitis B surveillance system was easy or very easy. Almost 20% of respondents found that examining individual cases on the surveillance system was excessively time consuming.

Add updates/enhanced surveillance information to existing events

Twenty-five respondents reported that they updated events, including enhanced surveillance information, on CIDR. However, when asked in a second question if they updated events on CIDR, including enhanced surveillance information, five additional respondents replied yes bringing the total to 30 respondents. A variety of stakeholder in regional Departments of Public Health updated events on CIDR. Overall the majority (n=26, 86.7%) of stakeholders who updated events found the system easy or very easy to use. Twenty-two (73.3%) respondents found the system satisfactory to use. Most (n=26, 86.7%) completed all possible fields when updating events. Almost one third (n=9, 31%) reported that there were too many fields to complete and seven respondents (25.9%) agreed that some of the fields were unnecessary for hepatitis B surveillance. The majority (n=20, 69%) of stakeholders who updated events on the system noted that moving back and forth between screens on the hepatitis B surveillance system was excessively time consuming, thirteen respondents (44.8%) thought that time was wasted entering the same information in several different fields and eleven (37.9%) respondents thought that there were too many tabs to complete on enhanced surveillance on the hepatitis B surveillance system.

Run reports on the hepatitis B surveillance system

Twenty-one respondents reported that they ran reports on the hepatitis B surveillance system. A variety of stakeholder in regional Departments of Public Health used the hepatitis B surveillance system to run reports. Almost all (n=20, 95.2%) the stakeholders who run reports on the hepatitis B surveillance system found the system satisfactory to use. Thirteen (61.9%) respondents who run reports found the system easy or very easy to use. Thirteen (61.9%) respondents reported that the reports produced by the surveillance system contained all the required information and 18 (85.7%) did not find running reports excessively time consuming.

Data validation

Eighteen respondents reported that they used the hepatitis B surveillance system for data validation. However, when asked in a second question if they used the system for data validation two additional respondents replied yes, therefore a total of 20 respondents used the hepatitis B surveillance system for data validation. A variety of stakeholder in regional Departments of Public Health used the hepatitis B surveillance system to validate data. Sixteen (80%) respondents who used the hepatitis B surveillance system for validating data found the system easy or very easy to use and 19 (95%) respondents found the system acceptable to use. Eleven (57.9%) respondents did not find data validation excessively time consuming while five (26.3%) respondents did. Seven (36.8%) respondents agreed that time was wasted validating the same data for several fields and four respondents reported that some variables necessary for validation were not relevant to hepatitis B.

Creating new events

Sixteen respondents reported creating new events on CIDR. However, when asked in a second question if they created new events, three additional respondents replied yes bringing the total to 19 respondents. A variety of stakeholders in regional Departments of Public Health created new events on the hepatitis B surveillance system. Most of the respondents (n=16, 84.2%) found the hepatitis B surveillance system easy or very easy to use and 17 (89.5%) respondents found the system acceptable to use. Ten (52.6%) of respondents completed all available fields when creating an event. However seven (41.2%) respondents reported that some of fields were not relevant to hepatitis B surveillance. The majority (n=13, 68.4%) of respondents agreed that time was wasted entering the same information in several fields, while 12 (66.7%) respondents agreed that moving between screens when populating fields was excessively time consuming.

Input laboratory data on LIMS/extract LIMS data to export to CIDR

Five respondents reported inputting laboratory data on LIMS/extracting LIMS data to export to the hepatitis B surveillance system on CIDR. All five respondents found the hepatitis B surveillance system acceptable to use and four (80%) out of five respondents found the system easy or very easy to use. One (20%) respondent thought that there were too many fields to complete when exporting data to the hepatitis B surveillance system. The three respondents who identified that the following statement was applicable to them: “I complete all possible fields all the time when entering data for export to the hepatitis B surveillance system” agreed that they did. The two respondents who identified that the following statement was applicable to them: “Some of the fields I have to complete for hepatitis B surveillance

system are unnecessary/not relevant" disagreed with the statement and the three respondents who identified that the following statement was applicable to them: "Time is wasted entering the same information in several different fields" disagreed with the statement. One respondent used the hepatitis B surveillance system to view the line listing only.

Suggestions on how to improve the system

A number of common themes were identified in the answers to this free text question. The most common suggestion was that the hepatitis B enhanced surveillance form should ask the same questions and follow the same order as on CIDR. Additional recurrent themes included: speeding up the system, removal of duplicate fields or facilitate auto-population of multiple fields requiring the same answer, a request that complete serological results are added by the laboratories for each patient and that multiple events requiring the same information could be updated simultaneously (Table 4)

Table 4. Suggestions on how to improve the hepatitis B surveillance system in Ireland

	Suggestion	Number of responses
1.	Questions on enhanced surveillance form should match and be in the same order as on CIDR	9
2.	Remove duplication -same information multiple fields	5
3.	Increase speed of CIDR	4
4.	Laboratories to add all serological results positive and negative and also add genotype and viral load as they become available	4
5.	Less fields to complete, more streamline	3
6.	Global update – be able to do the same update in multiple events simultaneously	3
7.	Remove recurrent refresh every time you fill a field	2
8.	Create new reports	1
9.	Remove restriction to choose only one risk factor (sometimes not possible to identify most likely risk factor	1
10.	Include interpretation of laboratory serological results	1
11.	More automation between laboratory and CIDR	1
12.	Stop repetition of same validation query every quarter	1
13.	Have expandable frames that adjust to text rather than having to constantly scroll down	1
14.	Too many screens to populate, one only if possible	1
15.	Ensure all fields are available to populate	1
16.	Stop entering serological results in the comments field	1

Discussion

Hepatitis B surveillance has been part of the national CIDR surveillance system in Ireland since 2004. This is the first time the system has been evaluated. We used five years of data for the evaluation. The hepatitis B surveillance system is a comprehensive system which fulfils all the general objectives of CIDR by collecting information on all notified cases of hepatitis B in a single national database, facilitating early detection of outbreaks and reporting to international agencies. The system also provides near real-time hepatitis B surveillance notifications to all CIDR users and facilitates appropriate public health actions at local and national levels. Disease burden and trends over time can be monitored on the hepatitis B surveillance system. Since 2012, the system distinguishes between acute and chronic cases, essential to ensure the appropriate public health recommendations are implemented. Sources of infection, including health care acquired infections, as well as risk groups are identified on the system, to facilitate the development of targeted interventions.

Acute hepatitis B cases

Data completeness for the five chosen non-mandatory variables was over 70% with risk factor and reason for testing information complete in over 90% of acute cases. This is reassuring as national public health guidance prioritises enhanced surveillance of acute cases. Risk factor data is especially important for acute hepatitis B cases and facilitates the development of targeted interventions for at-risk groups.

The time interval between earliest lab result on CIDR and CIDR event creation date is important as public health action will not commence until an event is created. Irish national guidance recommends that post-exposure prophylaxis with hepatitis B vaccine and sometime hepatitis B immunoglobulin should be given as early as possible after exposure to an acute hepatitis B case and within seven days to prevent ongoing transmission of hepatitis B infection and further cases[5]. Over 40% of acute hepatitis B cases with valid dates had a time interval greater than the time interval appropriate to implement the above control measures in a timely manner. This is of concern as the appropriate control measures should be implemented as early as possible after diagnosis, to prevent onward transmission of hepatitis B.

Almost a third of acute cases did not have a logical time interval between earliest lab result on CIDR and CIDR event creation date (event creation date was before the earliest CIDR lab result). Some possible reasons for this include: A confirmatory test date rather than the first test date may have been entered to CIDR; a case may have had multiple laboratory records and the earliest one may not have been entered on the enhanced form.

Chronic hepatitis B cases

Data completeness for the four chosen non-mandatory variables for chronic hepatitis B cases was lower than in acute cases. The prioritisation of acute cases may have reduced the likelihood of enhanced surveillance information on chronic cases. Incorporation of fields for risk factors and reasons for testing into laboratory request forms for hepatitis B diagnostic tests would reduce the requirement to complete enhanced surveillance on chronic cases and could be considered.

All hepatitis B cases

Our calculation indicates that up to half of the hepatitis B cases in Ireland are not notified to the hepatitis B surveillance system. While there are no stand-alone hepatitis B screening guidelines in Ireland, evidence suggests that certain populations are being screened such as: pregnant women[15], people who inject drugs[19] and asylum seekers[20]. Therefore the surveillance system is more likely to be representative of these groups. However in other at risk populations such as migrants from countries with high HBsAg prevalence, despite national guidance, systematic screening for hepatitis B does not take place. Consequently this group is unlikely to be represented accurately on the system. National guidelines on Infectious Disease Assessments in Migrants recommends screening the following groups for hepatitis B: migrants from countries with a HBsAg prevalence of ≥2%, household and sexual contacts of acute and chronic hepatitis B cases, women attending antenatal care services, sex workers and those who have been trafficked, people who inject drugs and men who have sex with men[21]. International evidence suggests other groups to test include: Looked-after children and young people, including those living in care homes, immunosuppressed and HIV-positive persons[22, 23].

Stakeholders used the hepatitis B surveillance system for a variety of tasks. The majority of stakeholders who responded to the questionnaire reported that they found the hepatitis B surveillance system acceptable and easy to use. The adjustment of the hepatitis B enhanced surveillance form to facilitate data entry onto CIDR was clearly important to stakeholders and would be a time saving measure. Suggested improvements to CIDR including: removal of duplicate fields, removal of recurrent screen refresh mechanisms and facilitating the simultaneous update of more than one event with the same data should be considered by the CIDR development team as these measures are likely to improve surveillance data overall and do not require additional resources. Improvements to the interface between laboratory systems and CIDR would also increase efficiency in the system and should be considered.

Strengths and limitations

This evaluation is the first evaluation of the hepatitis B surveillance system. It focuses on the following attributes; data completion, timeliness of reporting of acute cases, representativeness, simplicity and acceptability of the system. The evaluation highlights the completeness of data in acute cases, suggests possible issues with timeliness of reporting and documents important stakeholder feedback.

It is not a fully comprehensive evaluation, which would require considerable resources, a dedicated team, a considerable timeline and is beyond the scope of this project. In addition, the evaluation is limited to hepatitis B cases that are within the surveillance system and from our calculations, the burden of hepatitis B in Ireland could be double this.

Conclusions

The hepatitis B enhanced surveillance system is a relatively comprehensive surveillance system. Overall it fulfils several, but not all CIDR and ECDC objectives of hepatitis B surveillance system. Completeness of data is higher in acute cases than in chronic cases. Timeliness of cases could not be measured for one third of acute cases due to an illogical time interval. In cases where a timeliness measurement was possible, a considerable proportion of cases had an unacceptable time delay in notification. The hepatitis B surveillance system is more likely to be representative of acute cases of hepatitis B in Ireland but may not be representative of the population as a whole. In general, stakeholders agreed that the hepatitis B surveillance system was acceptable and easy to use. Suggested improvements included synchronicity between paper enhanced surveillance forms and the electronic CIDR system, removal of duplicate fields and increase efficiency of the CIDR system.

Recommendations

We recommend:

1. All hepatitis B cases should be classified as either acute or chronic to ensure appropriate infection prevention and control measures are implemented in a timely manner.
2. Individual Departments of Public Health might review recorded times in future acute cases of hepatitis B to improve quality of data.
3. Consider alternative methods of case management for all chronic cases to ensure that their close contacts are protected from hepatitis B infection.

Implementation of recommendations 1-3 could be undertaken via the Public Health Medicine Communicable Disease Group (PHMCDG) hepatitis sub-group. A short summary of the report will be developed for the PHMCDG hepatitis subgroup.

4. The amendment of the paper enhanced surveillance form to match the order of CIDR fields, where possible to improve the efficiency of data entry.

Revision of the hepatitis B enhanced surveillance form, to include amendments suggested by system users, will be undertaken by the hepatitis surveillance scientist at HPSC.

5. The implementation of existing hepatitis B screening guidance fully to ensure accurate capture of the hepatitis B population in Ireland in the future. This could be encouraged by circulating this report to relevant stakeholders.

A short summary of this report will be developed for general practitioners, highlighting the lack of representativeness, based on the Irish Census population, of surveillance data, in order to encourage screening of relevant patients in primary care.

6. The suggested CIDR system adjustments including removal of duplicate fields, facilitating simultaneous update of more than one event and addressing repeated screen refresh mechanisms, are discussed with the CIDR team at HPSC.

The CIDR issues were discussed with the CIDR team at HPSC. From the meeting it was agreed that the duplicate field within the hepatitis B enhanced surveillance system will be removed. However, it is not possible to provide a facility for simultaneous update of more than one event, and the apparent repeated screen refresh is not related to CIDR but due to local broadband capacity as CIDR is a web-based system.

The full report will be available in the hepatitis section of the HPSC website.

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