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Original Article

The value of active follow up of a newly acquired hepatitis B infection – lessons for current approaches

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Abstract

The standard practice of blood borne virus (BBV) follow-up in New South Wales is a passive approach of general-practitioner-led testing. The value of this approach is unknown. We undertook an active contact tracing method with the aims of investigating a potential hepatitis B source, along with accurately measuring the participation rate, to consider the value of this and other follow-up methods for future BBV investigations.

Investigation of a newly-acquired hepatitis B infection was undertaken at a dental practice identified as a possible exposure site. To screen for hepatitis B infection among potential source or co-exposed clients, we actively followed up with staff and clients of the practice to request they undertake hepatitis B serology. Eligible staff and clients received up to four phone calls and were provided with a pathology request form by the public health unit (PHU). Access to free serology was offered to people who did not have access to Medicare. Reminder calls were made if serology results were not received by the PHU. As the ordering doctor, the public health physician was responsible for providing results and referring for follow-up care.

Of 160 clients, 63 (39%) undertook hepatitis B serology. Of these 63, none were found to have hepatitis B infection. It was estimated the active investigation involved an extra 430 hours of PHU staff time at a cost in Australian dollars of $30,000.

Active follow-up allows an accurate participation rate to be documented. Despite intense active follow-up, only 39% of clients undertook testing, bringing into question the yield of the usual approach in which active follow-up of potential mass BBV exposures is not undertaken. While active follow-up is resource intensive, it should be considered where the risks and consequences from the BBV infection are high.

Keywords: hepatitis B; investigation; dental; public health; active

Introduction

Infection with hepatitis B virus leads to a spectrum of illness, ranging from subclinical infection to fulminant hepatitis, and may be acute or chronic. It is estimated that 0.86% of the Australian population are living with chronic hepatitis B infection, one of the predominant causes of liver cancer.[1] In Australia, hepatitis B is a notifiable disease and must be reported to the relevant state or territory public health agency. Newly acquired hepatitis B is uncommonly recognised and prompts a source investigation.[2]

On 3 March 2021 the South Eastern Sydney Public Health Unit (PHU), one of 15 PHUs in

New South Wales (NSW), was requested by another NSW PHU to investigate a local dental practice which was the only plausible source of a recently-notified newly acquired case of hepatitis B. The case had documented absence of hepatitis B infection in February 2020, yet in January 2021 had acute viral hepatitis and demonstrated antibodies to hepatitis B (immunoglobulin M [IgM] and core) and was hepatitis B surface antigen positive. After careful investigation of the case's exposures to known hepatitis B risk factors six weeks to six months prior to onset of illness, the only plausible source identified was a tooth extraction that occurred on 2 December 2020.

The identification of a dental practice as a potential source of hepatitis B infection triggered an environmental investigation of the dental practice by PHU environmental health officers and the Dental Council of NSW, which was undertaken on 16 March 2021. This environmental investigation concluded that the overall infection control processes and procedures at the practice were of an acceptable standard; however, a number of deficiencies were observed.

With a lack of any other obvious source and the potential public health impact should the source be the dental practice due to deficiencies in the dental practice processes, a source investigation of the dental practice was instigated. It was hypothesised that suboptimal environmental cleaning may have allowed contamination, from a client who underwent a procedure up to eight days prior, to persist and infect the new case on 2 December 2020 (as per environmental persistence advice in the NSW hepatitis B control guideline),[2] or that an infectious staff member on the day may have directly infected the new case. Clinic records did not include which chair clients were treated in, nor which staff members attended each procedure. Standard NSW Health practice for investigating blood borne virus (BBV) infections due to potential infection control breaches has generally involved contacting, by mail, clients and staff who attended the practice during the exposure period and requesting they undertake BBV testing with their local general practitioner (GP).[3,4] For those clients and staff who visit a regular GP, this process allows continuity of care for the client or staff member. It also requires minimal public health resource allocation. However, referring clients and staff to their GP for this type of follow-up provides little insight for the PHU regarding which clients or staff actually undertook testing, as the PHU is only notified if a client or staff member tests positive for a notifiable BBV infection. The PHU has no way of determining whether a client or staff member tested negative or did not test at all. Further, for those without a regular GP or lack of access to testing under Medicare, this is likely to be a barrier to testing. To counter these barriers, and due to the availability of additional skilled pandemic response surge staff who were under-utilised at the time, the PHU decided to trial active contact follow-up for this investigation.

It was hypothesised that this approach would lead to a high level of participation of clients due to the greater intensity of PHU follow-up and the removal of potential barriers to testing. The main aims of this approach were to identify the source of the case's infection; to determine the testing participation rate using this approach; and to estimate the extra resources required for active follow-up.

Methods

Dental practice staff and clients were considered eligible to participate in the investigation if they worked at the practice on 2 December 2020 or if they had undertaken a procedure at the practice between 25 November and 2 December 2020. Under the *Public Health Act 2010 (NSW)*, the PHU obtained staff and client details from the practice that included name, mobile phone number, email address and home address.

Eligible clients and staff were contacted between 26 April and 14 May 2021 by trained contact tracing staff and were advised to undertake hepatitis B serology. A minimum of four phone call attempts, conducted on different days and

times of the day, were made to each client or staff member. Information collected included confirmation of eligibility, date of birth, willingness to undertake a venepuncture for hepatitis B serology, Medicare access and general practitioner details. General practitioner details were sourced if a client or staff member answered 'yes' to whether they wanted their test results to be sent to their local GP. The client or staff member was then sent an email that included general information about the investigation and a pathology request form for hepatitis B serology (surface antigen, surface antibody and core antibody) with the PHU senior medical officer as requestor. To ensure no out-of-pocket expenses, pathology costs were assigned to Medicare or to the PHU (where access to Medicare was not available).

The outcomes of serological testing were categorised as follows: *Current hepatitis B infection* – Hepatitis B surface antigen (HbsAg) positive; *Susceptible* – Hepatitis B surface antibody (anti-HBs) < 10 mIU/mL, Hepatitis B core antibody (anti-HBc) and HbsAg negative; *Immune due to vaccination* – anti-HBs ≥ 10 mIU/mL, anti-HBc and HbsAg negative; *Resolved hepatitis B infection* – anti-HBc positive, anti-HBs positive, HbsAg negative; *Other* – HbsAg negative, anti-HBc not tested.

If a client or staff member could not be contacted after four call attempts, a message to contact the PHU was sent to the mobile phone number, along with the general information and pathology form to their email address.

Where the PHU had not received a test result from a client or staff member after approximately two weeks from last contact, a follow-up text message was sent to the client or staff member, reminding them to undertake hepatitis B serology.

A letter outlining the investigation and requirements of the participating client or staff member was sent to GPs nominated by the client or staff member.

Serology results were reported by laboratories to the ordering provider at the PHU. The GPs nominated by clients and staff members were also sent a copy of the results by laboratories. Clients and staff members were notified by the PHU of their results either by SMS (short message service, for results indicating prior vaccination, or no prior infection/vaccination) or by phone (for those with evidence of current or resolved infection, or inconclusive results). Nominated GPs were also called to advise them if the client or staff member had evidence of resolved infection, in case screening of household or sexual contacts was indicated, in accordance with standard NSW protocols.[2]

We examined whether successful phone contact with the client, access to Medicare, and access to a regular GP was associated with undertaking hepatitis B serology using chi-squared testing in SPSS v.27.0.

Resource hours were estimated using phone logs for contact tracers and time spent by administration staff and public health physicians in reviewing and following up complex results. Costings were assigned based on the average wage for each public health role, and pathology billings to the PHU were separately recorded and added to the costings.

This investigation was conducted under the powers of the *Public Health Act 2010 (NSW)*.

Results

Eleven staff members worked on the day of the procedure. No staff member had evidence of hepatitis B infection (all were HbsAg negative). Eight with full hepatitis B serology results available had evidence of immunity from vaccination.

A total of 160 clients were identified from practice records as being eligible to participate in the investigation. All had a mobile phone number recorded. One hundred and thirty six clients (85%) were able to be contacted by telephone, with only two indicating they would not

Table 1: Breakdown of dental client investigation numbers by eligibly, contact and tested status

Category	Client n (%)
Eligible	160 (100%)
Successful contact by phone	136 (85.0%)
Tested	63 (39.4%)

undertake hepatitis B serology. The remaining 24 clients were sent an SMS and email with our recommendations and pathology request form. After three months, the PHU had received 63 test results from laboratories (39% of 160 total identified clients), of which 62 were from clients able to be contacted by phone and one from a client who had received an SMS and email only (Table 1).

Date of birth was available for 115 clients with a median age of 32 years, range 19 to 79 years. Of the 136 client participants, 24 (18%) provided contact details for their GP and 21 (15%) indicated they did not have access to Medicare.

Examining the relationship between undertaking hepatitis B serology and possible predictors for client participation (successful phone contact; access to Medicare; and a nominated GP) a significant association was found only between successful phone contact with the client and undertaking hepatitis B serology (Table 2).

The results of seven (11%) of the 63 client participants who undertook a hepatitis B test were provided to the PHU only after the participant's two week SMS reminder to undertake a test.

The hepatitis B status of the 63 tested clients is reported in Table 3.

The investigation used 380 hours of contact tracing time at an estimated cost in Australian dollars (AUD) of $21,000; forty hours of public health physician time at an estimated cost of $7,300; ten hours of administration time at an estimated cost of $575; and $982 for non-Medicare pathology tests, above the standard approach.

Discussion

Despite more intensive follow-up of clients than is traditionally used in New South Wales, we did not find any client with hepatitis B infection to explain our case's infection. Our lack of source identification could be explained by our low participation rate of 39%. There is currently a lack of data on participation rates from BBV investigations in the dental setting for comparison. However, medical investigations in the United States of America from over two decades ago have reported that participation rates range from 33 to 90%, although the methods used to achieve these rates are not described.[5] Interestingly, only 47% of clients who expressed a willingness to be tested actually undertook testing, and 11% of those tested only did so after a follow-up reminder. Given evidence regarding increased participation with more active follow-up,[6] we hypothesise that the usual method of contact follow-up in BBV investigations in NSW (requesting contacts to visit their GP to arrange testing) is likely to have even poorer participation, challenging the usefulness of this standard approach. It is possible, however, that the low participation rate in this investigation could have been driven by a hypothesised lower community concern about hepatitis B, compared to HIV or hepatitis C.

The median age of client participants in this investigation (32 years) was slightly below that of the NSW population (38 years);[7] participants had a high rate of ineligibility for Medicare, indicating many were non-Australian residents and citizens. Regardless, we did not find that access to Medicare was a barrier in undertaking a hepatitis B test, which in part could be due to the PHU paying for testing of these participants. Had active follow-up not been in place, it is considered that this vulnerable group would be unlikely to follow testing recommendations. Another hypothesised barrier to testing was having a nominated GP. However, we did not find

Table 2: Chi squared analysis of hepatitis B serology versus various predictors

Predictor		Hepatitis B serology			*p* value
		Yes	No	Total	
Successful phone call	Yes	62	74	136	< 0.01[a]
	No	1	23	24	
	Total	63	97	160	
Medicare access	Yes	51	64	115	0.50
	No	11	10	21	
	Total	62	74	136	
General Practitioner	Yes	11	13	24	0.98
	No	51	61	112	
	Total	62	74	136	

a Fisher exact test.

Table 3: Hepatitis B client status

Hepatitis B status	Number of clients	Proportion of tested clients
Current hepatitis B infection	0	0%
Resolved hepatitis B infection[a]	5	7.9%
Immune due to vaccination	25	39.7%
Susceptible	32	50.8%
Other (HbsAg negative, anti-HBc not tested)	1	1.6%
Total with serology available	**63**	

a One person classified as resolved infection was core antibody positive only, as their GP reported a distant history of hepatitis B infection with previous positive anti-HBs.

this to be the case in our investigation, suggesting that our active contact follow-up approach was able to overcome these potential barriers.

Active follow-up used considerably more PHU resources than the standard approach. We estimate that this investigation cost $29,857 (AUD) above the standard approach. This resource allocation is significant for a PHU and would not have been possible without ready access to a contact tracing team which had been established for the COVID-19 response.

When selecting a follow-up approach, public health authorities need to balance the exposure risk and consequences with available resources. For high exposure risk/high consequence situations, more active follow-up may be warranted, while the more passive standard approach may be appropriate in low exposure risk/low consequence situations. This risk to resource approach has been advocated previously, including a suggestion that follow-up can be expanded if evidence of transmission is found.[8,9] However, in addition to the risk-based assessment, there are legal, ethical and reputational issues which may contribute to the degree of follow-up undertaken.[9,10] Furthermore, high resource follow-up may still result in low participation. Other resource-intensive approaches that may increase testing uptake include establishing drop-in clinics where contacts attend

for blood collection and counselling, sending PHU pathology request forms by mail, offering incentives, and establishing call-in lines for information and counselling,[11] which may be considered within a broader cost/benefit decision-making framework.

Active contact follow-up with testing ordered by the PHU relies on the PHU public health physician, rather than the client or staff member's GP, undertaking the primary responsibility for conveying results to the client or staff member and providing health advice. While this worked well operationally, it may not always be within the public health physician's scope of practice; it limits continuity of care; GPs may prefer to be more involved with screening of their patients; and there were a small number of people with evidence of resolved infection who could not be contacted by phone to advise them of their results.

This investigation highlights the challenges of mass follow-up during blood borne virus source investigations. With intensive follow-up and facilitating access to testing, we were only able to achieve a 39% participation rate. Further research is required to determine likely participation rates of the standard passive follow-up approach and therefore the value of the standard approach within a broader cost/benefit decision-making framework.

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