Audit of pneumococcal vaccination status in patients with invasive pneumococcal disease

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Introduction

Invasive pneumococcal disease (IPD) is a notifiable disease characterised by the presence of *Streptococcus Pneumoniae* in a normally sterile site and high associated morbidity.(1)

There are two types of pneumococcal vaccine; pneumococcal conjugate vaccines (PCV) and pneumococcal polysaccharide vaccine (PPV23). PCV is part of the Irish childhood immunization schedule. One dose of PPV23 is recommended for all aged 65 years and older. Those at increased risk of IPD are offered PPV23 +/- PCV. PPV23 effectiveness is low, and reduces with time since vaccination, increasing age and co-morbidities. (2)(3)

The addition of PCV to the Irish childhood vaccine schedule has reduced the overall burden of IPD across all ages. (4)(5) However, there has been an increase in incidence of non-PCV13 serotypes or non-vaccine types (NVTs). (6)(7)

Aim

The aim was to assess pneumococcal vaccination status for those patients known to have IPD in 2019 in St. James's Hospital.

Method

Patients were identified from the antimicrobial stewardship database, identifying those who had IPD in 2019. The genotype was identified. Their hospital healthcare record was reviewed. Their GP was contacted to assess their vaccination history against pneumococcal disease.

Results

There were thirteen cases of IPD in 2019 in St. James's Hospital. Of these thirteen cases, eleven patients were affected. One woman experienced three different serotypes of IPD within 2019 (6C, 19A, 11A). There were five males and six females. Cases ranged in age from 21 to 87 years, with an average age of 68. Six cases were in patients aged >65years, (46%).

On review of risk factors at time of IPD, all patients (n=11) met guideline criteria recommending vaccination. Seven patients had high risk factors for IPD such as active cancer under hospital supervision (n=5), chronic kidney disease (n=1) and HIV (n=1). Eight patient were smokers. Nine patients had medium risk factors for IPD such as chronic heart, lung, or liver disease or diabetes mellitus.

High risk (Group A)	Medium risk (Group B)
• Asplenia, hyposplenia (including splenectomy, sickle cell disease, haemoglobinopathies, and coeliac disease)	• Children under 5 years of age following invasive pneumococcal disease
• Cancer patients under hospital supervision	• Chronic heart, lung, or liver disease
• Chronic renal disease or nephrotic syndrome	• Diabetes mellitus requiring insulin or oral hypoglycaemic drugs
• Cochlear implant candidates and recipients	• Down syndrome
• Complement deficiency (particularly C1-C4)	• Occupational exposure to metal fumes (i.e. welders)
• CSF leaks (congenital or complicating skull fracture or neurosurgery)	• Smokers and alcoholics
• Haematopoietic stem-cell transplant	
• Immunosuppressive conditions (e.g. some B- and T-cell disorders, HIV infection, leukaemia, lymphoma), and those receiving immunosuppressive therapies[1] or corticosteroids (see Chapter 3).	
• Intracranial shunt	
• Solid organ transplant	

Table 1 - Conditions associated with an increased risk of invasive pneumococcal disease (1)

Nine genotypes were identified: 11A, 8, 20, 6A, 6B, 6C, 4, 19A, and 22F. (in order of decreasing frequency). This is similar to the HPSC data for quarter 1 of 2019; predominant serotypes being: 8,19A and 12F.(8) Nine cases (70%) were caused by non-PCV13 vaccine serotypes. Four patients suffered a PCV13 vaccine serotype IPD; 4, 6A, 6B, and 19A. Of note 6C is a non-vaccine type.

Serotype	Number of cases	Covered by vaccination?	Number of patients with history of vaccination against this serotype
4	1	PCV13 + PPV23	1 (PPV23)
6a	1	PCV13	0
6b	1	PCV13 + PPV23	1 (PPV23)
6c	1	-	0
8	2	PPV23	0
11a	3	PPV23	2
19a	1	PCV13 + PPV23	0
20	2	PPV23	2
22f	1	PPV23	0

Table 2 - Serotype Data (n=13)

Six patients were vaccinated with PPV23 before their pneumococcal infection,(46%). However, all six of these patients experience a PPV23 serotype infection; 4, 6B, 11A, and 20. The timeline delay between vaccination and infection was between 2 to 17 years, average 7 years. Four of these were >65years at time of vaccination. Two patients aged <65years did not receive PCV, despite one of them being a high-risk patient. Both were subsequently infected with serotype 20 (non PCV type).

Only one patient was vaccinated after IPD with both PCV and PPV23. This was the woman who experienced three IPD infections in 2019.

Two of the four patient who suffered a PCV13 serotype IPD would have been classified as high-risk candidates at time of IPD, and as per guidelines could have be offered the PCV13 vaccine as well as PPV23.

Of the thirteen discharge summaries to the GP, nine documented the diagnosis of invasive pneumococcal disease. Only three discharge summaries (23%) recommended vaccination despite risk factors being present.

Conclusion

It is important that at risk patient groups are identified for vaccination. This is especially true for those that are high risk to allow vaccination with PCV13 and PPV23.

There has been a shift in the prevalent serotypes associated with IPD, due to the replacing serotypes after the introduction of the PCV. (2)(4) Many of the replacing serotypes causing IPD in adults are currently included in PPV23 and not in PCV13. (5) The PPV23 is already recommended for elderly and risk groups. The PPV23 vaccine is important to give additional protection against the change in serotype, despite its lower vaccine efficacy than the PCV.

Ongoing work needs to continue to assess the impact of the PCV immunisation as well as the effectiveness of PPV23. This includes the testing of sterile sites to obtain samples for the diagnosis of IPD. These cases of IPD should then be serotyped and notified.

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