TURNING THE TIDE: REDUCED INCIDENCE OF IDU-ASSOCIATED INFECTIVE ENDOCARDITIS FOLLOWING CHANGE TO CHLORHEXIDINE-ALCOHOL SKIN ANTISEPSIS: A PUBLIC HEALTH INTERVENTION

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Background

The incidence of infective endocarditis (IE) is increasing worldwide (up to 11.6/100,000 per year) with an increase in mean age (from 45.3 years to 57.2 years over 50 years in one study).[1] Staphylococci are taking over viridans streptococci as the commonest pathogen (up to 53.4%) and enterococci arebecoming more common.[2] There has been an increase in the use of cardiac and intravascular access devices and infections associated with these devices are more likely to be healthcare-associated.[3,4] Since 2007 there have been changes in recommendations for antibiotic prophylaxis for dental procedures with the NICE guidelines recommending against prophylaxis.[5]

Injecting drug use (IDU) is becoming an increasingly important risk factor for infective endocarditis globally and currently accounts for about 10% of cases of IE overall although this is increasing in places like the United States where there is an opioid crisis.[6,7] A recent study showed a significant increase in the overall incidence of IE including IDU-IE in Victoria, Australia between 2009 and 2014.[8]

Skin antisepsis with chlorhexidine has been associated with lower rates of bloodstream infection and surgical site infections.[9] In 2015 the antisepsis wipes distributed by the Needle Syringe Program (NSP) in Victoria were switched from 70% alcohol to 2%chlorhexidine-70% alcohol to try and reduce the incidence of IDU-IE.

Aims

To describe the incidence and patient demographics of IE and IDU-IE cases in Victoria between 2014 and 2018 and compare these to previous years. To evaluate the effect of changing the antisepsis wipes distributed by the NSP from 70% alcohol to 2% chlorhexidine-70% alcohol.

Methods

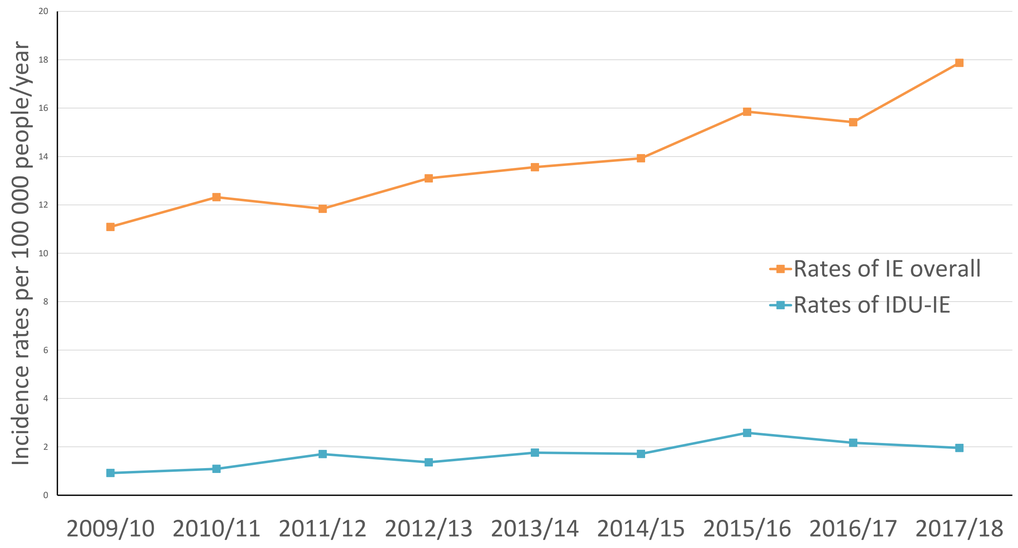
Cases of IE and IDU-IE were identified from the Victorian Admitted Episode Dataset (VAED) between 2014-2018. Incidence rates were calculated per 100,000 people/year and compared with those from the previous study. Rate ratios and 95% confidence intervals were calculated and compared using Poisson distributions with 2009 used as the reference point. Chi squared test for trend were calculated to identify significant linear trends.

Results

Incidence of IE and IDU-IE

The incidence of IE overall increased from 11.1/100,000 people per year in 2009 to 17.87/100,000 people per year in 2018 (Fig. 1). The total number of IE cases in Victoria almost doubled between 2009/10 (606) and 2017/18 (1149). However in recent years the number of IDU-IE cases has started to decline since 2015/16 (97 cases). The incidence rate was 0.92 in 2009, rising to 2.58 in 2015/16 and dropping down to 1.95 in 2017/18. The test of trend had a p value of <0.0001 for both IE and IDU-IE. (Table 1).

Fig. 1 - Incidence rates of IE and IDU-IE between 2009 and 2018



Sex

IE overall was more common in men with a 2:1 ratio (66% of cases overall as well as on average each year) and this ratio remained stable between 2009 and 2018. However in IDU-IE the ratio was lower, 1.4:1 in 2014/15 and dropping down to 1.2:1 in 2017/18. (Fig. 2)

Age

The age group most affected by IE over the years was 75-79 years (920 cases, 12.9% overall) however IDU-IE cases peaked in the 30-34 age group (126 cases, 21.5% of IDU-IE). (Fig. 3)

Even though the denominator for IDU-IE incidence was working age population (15-64 years) there were no cases of IDU-IE in persons aged 19 or under but there were 9 cases of IDU-IE in patients aged 60 or older (3 between 2009-2014 and 6 between 2014-2018). The decline in IDU-IE since the intervention was greatest in the 25-29 and 30-34 age group.

Figure 2: Number of IE and IDU-IE cases according to sex

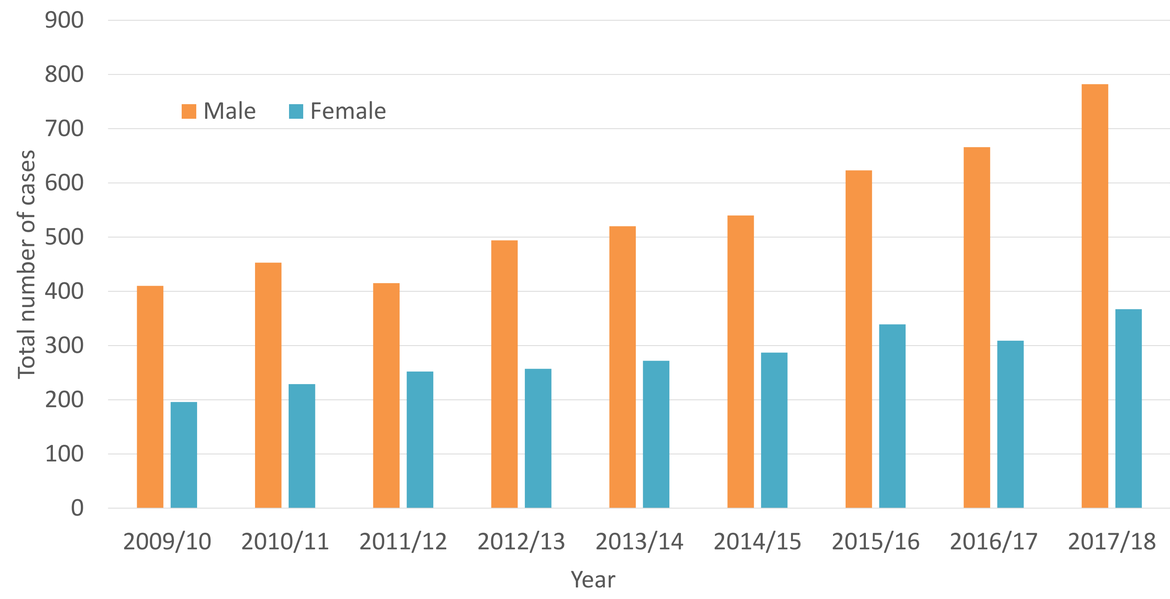


Figure 3: Number of IE and IDU-IE cases according to age group

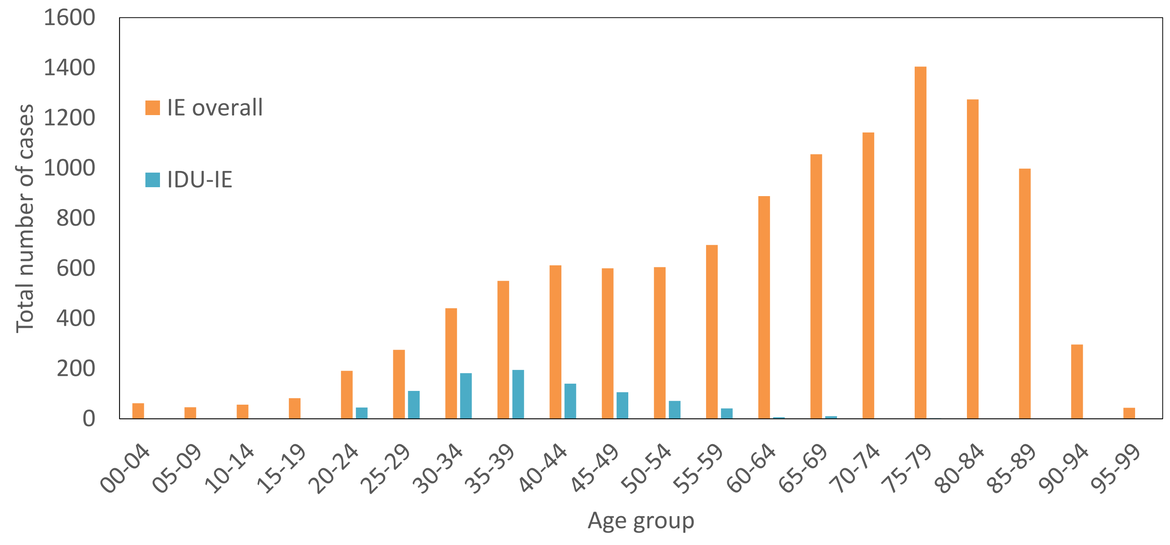


Table 1: Rate ratios and test of trend

IE			IDU-IE		
Year	Rate Ratio (95% CIs)	p-value	Year	Rate Ratio (95% CIs)	p-value
2009-2010	1 (ref)		2009-2010	1 (ref)	
2010-2011	1.11 (0.99-1.24	0.062	2010-2011	1.19 (0.75-1.87)	0.455
2011-2012	1.07 (0.96-1.19)	0.247	2011-2012	1.85 (1.22-2.81)	0.004
2012-2013	1.18 (1.06-1.31)	0.002	2012-2013	1.48 (0.97-2.28)	0.072
2013-2014	1.22 (1.10-1.36)	p<0.0001	2013-2014	1.93 (1.28-2.90)	0.002
2014-2015	1.26 (1.13-1.39)	p<0.0001	2014-2015	1.87 (1.23-2.83)	0.003
2015-2016	1.43 (1.29-1.58)	p<0.0001	2015-2016	2.81 (1.90-4.16)	p<0.0001
2016-2017	1.39 (1.26-1.54)	p<0.0001	2016-2017	2.37 (1.59-3.52	p<0.0001
2017-2018	1.61 (1.46-1.78)	p<0.0001	2017-2018	2.14 (1.43-3.19)	p<0.0001
	Test of trend (x^2) df(8) = 158.41	p<0.0001		Test of trend (x^2) df (8) = 46.26	p<0.0001

Discussion

There has been a shift in the epidemiology of infective endocarditis in the last few decades due to factors such as an ageing population and increased use of cardiac and intravascular access devices. In Australia there are few population based studies for comparison. One such study in Victoria showed a significant increase in IE overall between 2009 and 2014 and our study shows that this trend is continuing to increase.[8] Demographics are similar to those observed in other parts of the world with older age groups more likely to be affected and males more affected than females. The incidence of IDU-IE varies worldwide, although it had been increasing in Victoria between 2009-2015 there has been a decreasing incidence rate since 2016 despite the fact that injecting drug use in Australia is still rife.

Conclusions

The overall incidence of IE in Victoria has increased due to a number of epidemiological risk factors. The incidence of IDU-IE has started to decline since 2016 and this is temporally associated with the change in antisepsis wipes distributed by the NSP from 70% alcohol to 2% chlorhexidine-70% alcohol.

References

1. Slipczuk L, Codolosa JN, Davila CD, Romero-Corral A, Yun J, Pressman GS, et al. (2013) Infective Endocarditis Epidemiology Over Five Decades: A Systematic Review. PLoS ONE 8(12): e82665.
2. Vogkou, CT; Vlachogiannis, NI; Palaiodimos, L; Kousoulis, AA; (2016) The causative agents in infective endocarditis: a systematic review comprising 33,214 cases. *European journal of clinical microbiology & infectious diseases,* 35 (8):1227-45.
3. Fowler VG, Miro JM, Hoen B, et al. (2005) *Staphylococcus aureus* Endocarditis: A Consequence of Medical Progress. *JAMA,* 293(24):3012–3021.
4. Athan E, Chu VH, Tattevin P, et al. (2012) Clinical Characteristics and Outcome of Infective Endocarditis Involving Implantable Cardiac Devices. *JAMA,* 307(16):1727–1735.
5. Prophylaxis against infective endocarditis: antimicrobial prophylaxis against infective endocarditis in adults and children undergoing interventional procedures, *NICE* 2008
6. Murdoch DR, Corey GR, Hoen B, et al. (2009) Clinical Presentation, Etiology, and Outcome of Infective Endocarditis in the 21st Century: The International Collaboration on Endocarditis–Prospective Cohort Study. *Arch Intern Med,* 169(5):463–473.
7. Schranz AJ et al. (2018) Trends in drug use–associated infective endocarditis and heart valve surgery, 2007 to 2017: A study of statewide discharge data. *Ann Intern Med* [e-pub]. (https://doi.org/10.7326/M18-2124)
8. Wright A, Otome O, Harvey C, Bowe S, Athan E. (2018) The Current Epidemiology of Injecting Drug Use-Associated Infective Endocarditis in Victoria, Australia in the Midst of Increasing Crystal Methamphetamine Use. *Heart Lung Circ*, 27(4):484-488.
9. Mimoz et al. (2015) Skin antisepsis with chlorhexidine–alcohol versus povidone iodine–alcohol, with and without skin scrubbing, for prevention of intravascular-catheter-related infection (CLEAN): an open-label, multicentre, randomised, controlled, two-by-two factorial trial *The Lancet*, 386(10008):2069-207