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Microbial Resistance patterns in Periprosthetic joint infection of the knee – A Twenty-Year Longitudinal Study

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Faculty Disclosure Information

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Introduction

- Periprosthetic joint infections (PJIs) of the knee can catastrophic
- Management of PJI is challenging for both the surgeon and the Infectious Disease specialist
- Early recognition of the implicated and initiation of the appropriate empiric antibiotics is critical in improving treatment success

Aim

1) To identify pathogens and respective antibiotic sensitivities in knee PJIs

2) Analyze incidence of resistant organisms

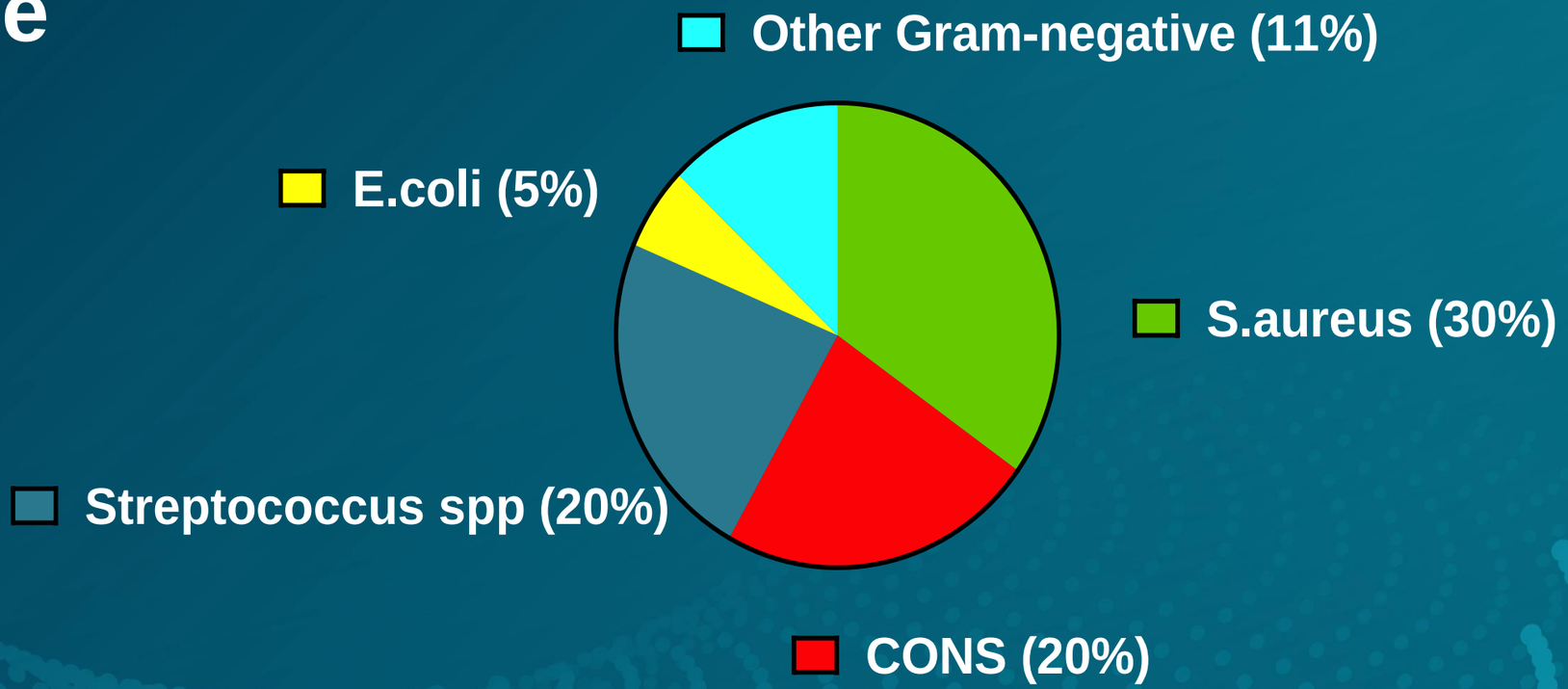
3) Provide updated recommendations for empiric antibiotics for knee PJIs

Method

488 cases of first episode PJIs in Auckland between 2001–2023 were identified. Microorganisms and its respective antimicrobial sensitivities were recorded from positive cultures and aspirates.

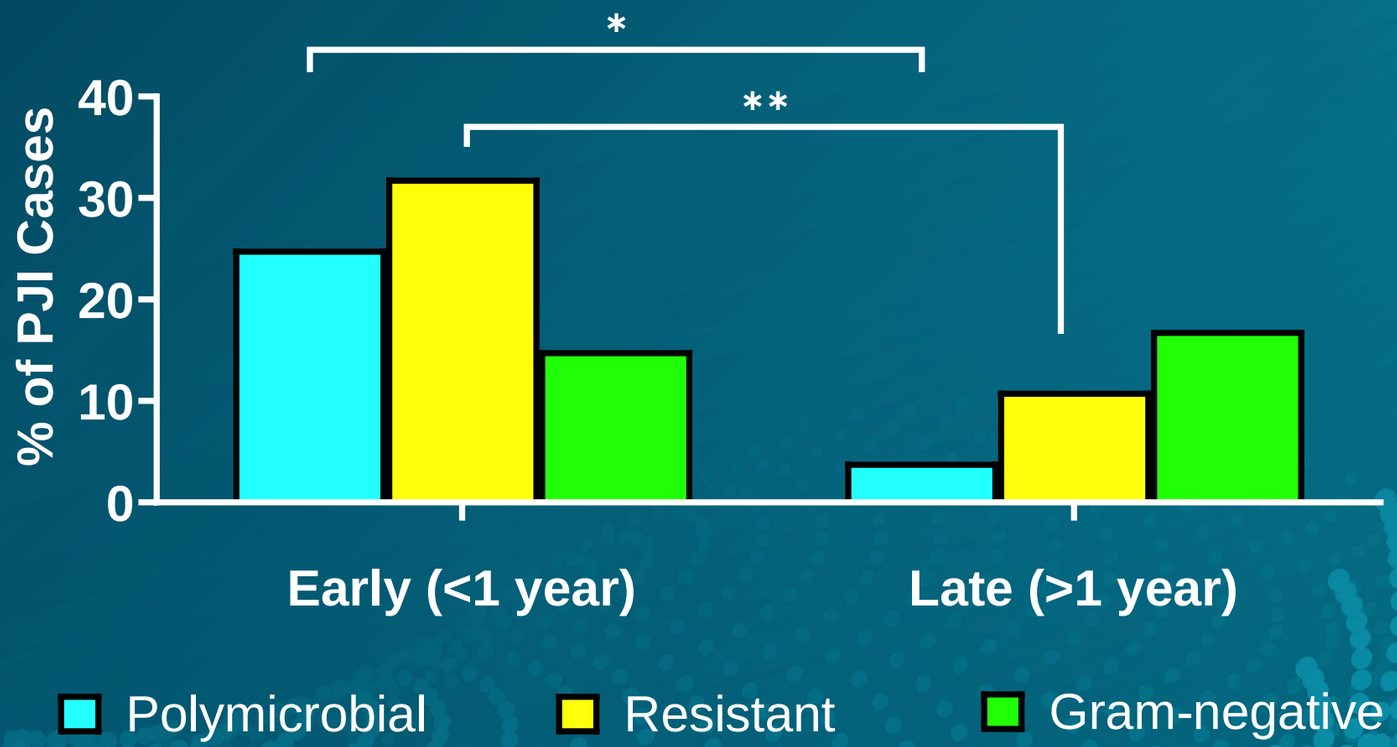
Early cases were classified as PJIs less than one year since replacement. **Late cases** were classified as PJIs with implants older than one year.

The pathogens implicated in PJIs of the knee



- *Staphylococcus aureus*, Coagulase negative *Staphylocci* (COS) and *Streptococcus* spp. were the most common pathogens overall in knee PJI
- *E.coli* was the most common Gram-negative pathogen in knee PJI

Early vs late PJIs of the knee



- Early PJIs (<1 year since primary) are at higher risk of resistant organism and polymicrobial infections
- The proportion of Gram-negative pathogens was similar between Early and Late PJIs

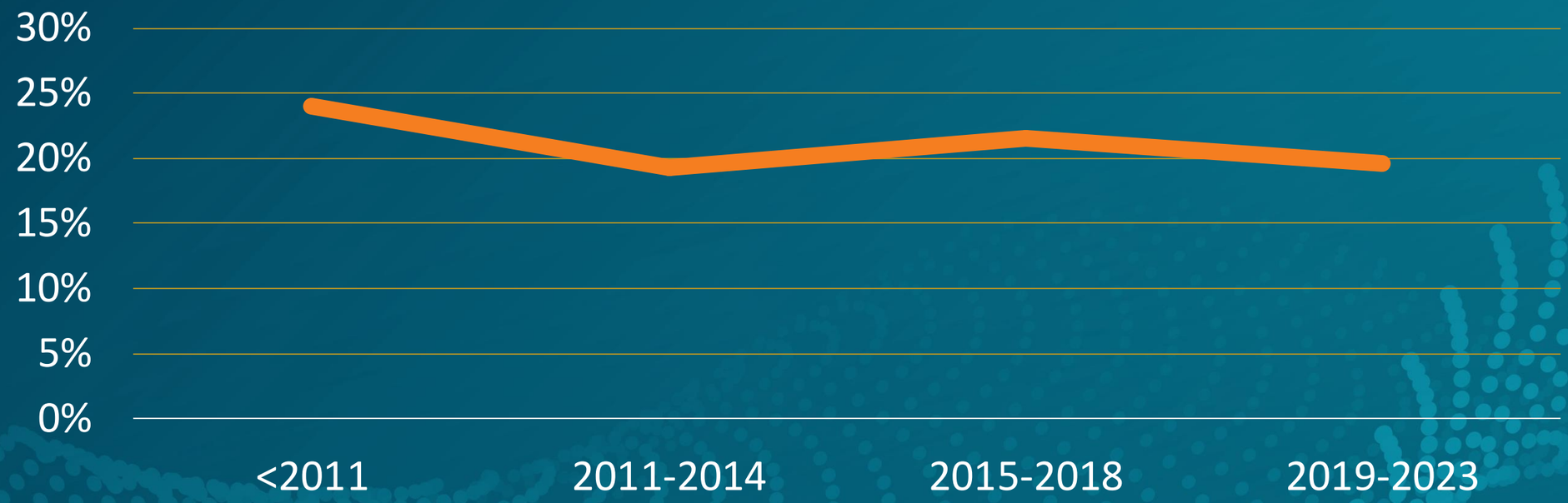
Antibiotic coverage for PJIs of the knee

Monotherapy coverage (%)	Early	Late
Flucloxacillin	56%	75%
Vancomycin	82%	81%

Dual therapy coverage (%)	Early	Late
Flucloxacillin + Cefuroxime	71%	89%
Flucloxacillin + Gentamicin	70%	82%
Flucloxacillin + Cotrimoxazole	84%	91%
Vancomycin + Cefuroxime	90%	92%
Vancomycin + Gentamicin	97%	98%
Vancomycin +Cotrimoxazole	95%	94%

- Vancomycin was found to be an effective monotherapy agent in both early and late knee PJIs.
- Dual therapy of Vancomycin and a gram-negative agent was most effective, resulting in increased coverage to above 90%.

Trend of microbial resistance among PJIs of the knee



- When stratified into 4-year bands from 2011 onwards, the incidence of resistant organisms (Gram-positive resistant to flucloxacillin and Gram-negative resistant to 2nd generation cephalosporin) remain steady throughout the years.

Conclusion

- Staphylococcus and E.coli are the primary gram-positive and gram-negative microorganisms in knee PJIs, respectively.
- Early PJIs are at significantly higher risks of polymicrobial and resistant infections, thus, dual antibiotics therapy should be considered.
- Beta-lactams proves to be a poor agent of choice as an empirical antibiotic, and vancomycin is superior as a monotherapy agent in both early and late PJIs.

References

- Koh CK, Zeng I, Ravi S, Zhu M, Vince KG, Young SW. Periprosthetic joint infection is the main cause of failure for modern knee arthroplasty: An analysis of 11,134 knees. Clinical Orthopaedics & Related Research. 2017 Sept;475(9):2194–201. doi:10.1007/s11999-017-5396-4
- Lum ZC, Natsuhara KM, Shelton TJ, Giordani M, Pereira GC, Meehan JP. Mortality during total knee periprosthetic joint infection. The Journal of Arthroplasty. 2018 Dec;33(12):3783–8. doi:10.1016/j.arth.2018.08.021
- Kim K, Zhu M, Coleman B, Munro JT, Young SW. Differing microorganism profile in early and late prosthetic joint infections following primary total knee arthroplasty — implications for empiric antibiotic treatment. The Journal of Arthroplasty. 2022 Sept;37(9). doi:10.1016/j.arth.2022.04.014
- Fulkerson E, Valle CJ, Wise B, Walsh M, Preston C, Di Cesare PE. Antibiotic susceptibility of bacteria infecting total joint Arthroplasty Sites. The Journal of Bone & Joint Surgery. 2006 Jun;88(6):1231–7. doi:10.2106/jbjs.e.00004
- Ravi S, Zhu M, Luey C, Young SW. Antibiotic resistance in early periprosthetic joint infection. ANZ Journal of Surgery. 2016 Aug 25;86(12):1014–8. doi:10.1111/ans.13720
- Klasan A, Schermuksnies A, Gerber F, Bowman M, Fuchs-Winkelmann S, Heyse TJ. Development of antibiotic resistance in periprosthetic joint infection after total Knee Arthroplasty. The Bone & Joint Journal. 2021 Jun 1;103-B(6 Supple A):171–6. doi:10.1302/0301-620x.103b6.bjj-2020-1923.r1