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February 13, 2019
Journal Reviewer

Simulation shows hospitals that cooperate on infection control obtain better results than hospitals acting alone.

Lee BY[1], Bartsch SM, Wong KF, Yilmaz SL, Avery TR, Singh A, Song Y, Kim DS, Brown ST, Potter MA, Platt R, Huang SS.

Abstract:

The article focuses on studying how infections, in this case methicillin-resistant *Staphylococcus-aureus* (MRSA), can get complicated when patients are transferred from hospital to another. The study uses a computer simulation to model how transmission of MRSA in Orange County, CA hospitals can be altered using the preventative measures of testing for MRSA upon patient admission and utilizing procedures that limit infection for those testing positive. The study found that testing for MRSA upon admission and applying the procedures described as above can affect the MRSA prevalence in hospitals.

Comments:

The article accurately and concisely describes the broader context of the research, research question, results, and the implications of their findings.

Introduction:

The researchers review the literature by identifying the lack of communication/cooperation between hospitals, unless financial or academic programs exist that connect the organizations. The article then goes on to identify infections that hospitals attempt to control within their environment and the prevalence of MRSA and MRSA spread in hospitals. They describe methods of preventing MRSA spread within hospitals and acknowledge their previous works identifying interconnectedness of patient transfers between hospitals in Orange County. Their previous study showed that control practices and lapses affected the spread of infections, such as MRSA. This study is a follow up study that asks the question of whether cooperation amongst hospitals can lead to "gains in infection control". They wanted to evaluate a two-part intervention: 1) testing patients upon admission for MRSA and 2) utilizing "contact isolation procedures for all staff interacting with positive patients".

Comments:

The article does an adequate job of identifying the broader context of their study and then narrowing it down to their research question in the introduction. The sources used were relevant to their topic and the citations of their previous studies was appropriate for the context of the article. The introduction is concise. As a reader, the inclusion of more details about hospital investment into control measures would have been appreciated, however it does not detract from the overall article.

Methods:

The computer simulation used admission rates and infection rates of five hospitals (utilizing hospital records) with an average of 3,740 virtual patients, each with a computational agent, moving among the hospital and communities. The model simulated MRSA transmission within the hospitals. The model utilized data from the hospitals that described: intensive care units, bed capacity, annual admissions, hospital stay lengths, along with how hospitals shared patients and transfer patterns. The computer

simulation assumed that the MRSA screen had a sensitivity of 75% and a specificity of 97%, while also assuming turnaround time from test to result to be two days. Contact isolation only began after a patient had a positive test result delivered. They explored different hospital sizes including those of high capacity and high volume. They also explored the level of hospital care worker compliance.
MRSA cases were identified in the simulation based on numerous factors as described in their Appendix.

1. Number of patients susceptible
2. Number of positive cases not undergoing contact isolation
3. Compliance of health care workers to interventions

Comments:

The authors outline the limitations of their methodology at the end of the methods sections and acknowledge that this experiment is a model and is a simplification of real-life situations. For example, their screening for MRSA and turn around for test results may be ambitious and not representative of the hospitals they are studying. The model also does not consider the number of health workers within the hospitals and how that may vary amongst the hospitals. They also acknowledge that the model does not consider the change in baseline MRSA prevalence from year to year. The model may not be representative of the diverse population of Orange County and does not focus on pediatric hospitals.

Results:

The study found that the implementation of surveillance and isolation in one hospital decreased MRSA prevalence within the hospital but also in surrounding hospitals that did not implement the procedures. The more hospitals that implemented prevention procedures, the greater reduction in MRSA prevalence and new MRSA cases.

Comments:

The study separates the results into subheadings based on what factors they were testing which helped with the flow and comprehension of the results. The study should include a graph, like that of Exhibit 3, for median reduction of each hospitals' MRSA prevalence (%) for easier comprehension of data. Exhibit 3 shows cases averted and a second graph should be included to describe the other half of data in Exhibit 2 table. In general, the use of graphs would have benefitted their extensive use of tables. The results are presented relatively clearly and comprehensively while aligning with the research questions asked at the beginning of the article. The figures used were clear and concise and supplemented the research questions being asked.

Discussion:

The use of surveillance and isolation procedures for MRSA infections in hospitals can impact the MRSA control in singular hospitals as well as surrounding hospitals. The more hospitals that work together, the better MRSA control they can achieve. This arises from patient sharing amongst hospitals near one another. The article goes on to describe statewide approaches and interventions to reduce hospital-acquired infections. The article makes the notion that even though they only explored two kinds of intervention, their results would still hold for other methods of intervention if MRSA prevalence is reduced by these methods.

Comments:

The article adds to existing literature and supplements the need for further demonstrations of cooperative interventions and policies amongst geographically close hospitals and the effects they may have. The researchers use their data to supplement policies and initiatives that are taking place presently in some states/organizations, such as the California Healthcare-Associated Infection Prevention Initiative. The discussion and conclusions expose how this data can benefit policymaking that is already occurring and addresses their initial research question. The overall recommendation is provisional acceptance, with minor changes required, such as the inclusion of figures and additional introduction information.

Overall this paper is relevant because it is addressing how cooperative prevention and isolation procedure can benefit community hospitals and limit infection spread along with new infection cases. The use of a computer simulation can model how new policies and interventions can impact hospital systems without the extensive resource expenditure as other studies may require (longitudinal, case-control, etc.). This kind of modeling can serve as a preliminary study to show the benefits or hindrances a policy or intervention can have on a large community scale.