Analysis of Data Reports

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Slide 1: Intro Slide

Slide 2 for Analysis of Data Reports. In this presentation, we will be looking at the journal articles: Effect of bar-code assisted medication administration on medication administration errors and accuracy in multiple patient care areas (2009) which will be deemed as Study 1, and Detection and Prevention of Medication Errors Using Real-Time Bedside Nurse Charting (2005) which will be deemed Study 2. There are several areas of discussion to cover ranging from the different types of statistical testing used in the studies to different studies that may have been used in the same type of testing field. The presentation will also cover type 1 and type 2 errors as they may be presented in the articles, as well as if any hypothesis errors are present, and the use or lack of parametric procedures or nonparametric procedures. The analysis of the information will include why certain tests were used and the results of the testing. This presentation will look at the reasons for some errors and how the errors affected the different studies.

Slide 3 for Analysis of Data Reports. Looking at whether parametric or nonparametric procedures were used in study 1, we first need to understand the meaning of each. Parametric test “rely on assumptions about the distribution of the underlying population from which the sample was taken and the most common assumption is that data are approximately normally distributed, where non parametric does not rely on assumptions” (Hoskins, 2010, p. 2). Looking at study 1 we could say that parametric testing were used because all though the data was compared between the different units before and after the initiation of the BCMA, we know there were errors in the study. Showing there were ways around the BCMA, then we can say there were assumptions made based on the data. When seeing there could be assumptions made then we
should also consider the validity of the assumptions. Even though there are shortcuts around the BCMA were they used? and did this affect the study over all, these are just a few questions that need to be looked at when analyzing the data. Both sets of tests could be used, nonparametric if there were no shortcuts and the data is appropriate without any assumptions. There are shortcuts around the BCMA, and can assume parametric procedures were use.

Slide 4 for Analysis of Data Reports. In study 2 I feel non parametric testing was used. There are no assumptions to the outcome and no shortcuts to the use of data. The control study group was not given additional education and the data collected from this group is how they would operate on a normal day. The study group given the education and feedback did improve from their learning. The data was collected from each group and compared to overall performance against the control group and this showed the additional education and learning did improve the overall charting, both real-time and bedside. “Nonparametric methods provide an air of objectivity when there is no reliable underlying scale for the original data and there is some concern that the results of standard parametric techniques would be criticized for their dependence on an artificial metric” (Dallal PHD, 2010, p. 1). Study 2 seems to be more concrete in the data with fewer chances of error, where study 1 shows there are ways around the BCMA and more errors could be made.

Slide 5 for Analysis of Data Reports. According to Trochim (2006), “The t-test assesses whether the means of two groups are statistically different from each other” (p. 1). The t-test was chosen for this study because two types of patient care units were compared in several different areas, and the t-test is the best choice for this type of study. The results of the t-test show that the data suggests that the BCMA implementation made statistically significant changes to the
accuracy of medication administration on the medical-surgical units observed in the study, but had very little impact on the ICU units (Helmons, Wargel, & Daniels, 2009).

On the medical-surgical units, the benefits of using BCMA were apparent through the decrease in the number of different types of medication errors, such as administering the medication at the wrong time or administering the wrong medication. In the ICU units, the number of wrong-time medication errors increased, while the number of other types of medication areas dropped a small amount. The number of all medication errors after the implementation to the ICU units went up (Helmons et al., 2009).

Slide 6 for Analysis of Data Reports. The student t-test was also used for the second study, due to the appropriateness of the data needed and number of groups being studied. This article compares two patient units that are similar in type and size. One unit was educated and coached when using an electronic medication administration charting system and observed to see the improvement in following through with the necessary charting before the education and after. Another unit was also observed, but did not receive the coaching and education the other group had (Nelson, Evans, Samore, & Gardner, 2005).

The results of the test in study #2 show that the education and coaching given to the study unit was an important factor in raising the frequency of medication administration charting. In the control unit, the rate actually went down. These findings suggest that education and consistent coaching are effective ways to increase the rate of medication administration charting (Nelson et al., 2005).

Slide 7 for Analysis of Data Reports. In the first study hypothesis testing errors were not discovered to be present, but the discovery was made that there were many “work-around strategies after implementation of BCMA” (Helmons et al., 2009, p. 1203). This study did not
represent all of the accuracy indicators of intentional workarounds performed by the nurses administering the medications. This particular study reflected only certain error types such as: the wrong drug, the wrong form of the drug, incorrect dose, incorrect route of administration, any extra doses given, and complete omission of the drugs. Workarounds are performed by the nurses to bypass the bar-code-assisted administration. Examples of some workarounds are: attaching patient barcodes to computer carts to avoid in-room scanning, incomplete barcodes, and missing patient barcodes (Koppel, Wetterneck, Telles, & Karsh, 2008).

Slide 8 for Analysis of Data Reports. There are 2 types of errors that can occur from a hypothesis test, type 1 and type 2 error. Type 1 error is when the researcher denies a null hypothesis when it is actually true and type 2 is where the researcher does not reject the null hypothesis when it is in fact false. In the second study there were no hypothesis testing errors presented. The researchers used a control group and a study group, then compared the data obtained from both groups. The control group continued their real-time carting and bedside charting as they normally would. The study group on the other hand was given additional education on how to avoid errors and received feedback often through the study. In conclusion of the study research showed the study group who were given additional education greatly improved over the control group who did not. The initial percentage of real-time charting was 59% and bedside charting was 40%, after the education and feedback the rate improved to 73% for real-time charting and 63% for bedside charting for the study group (Nelson et al., 2005). The control group was from 53% to 57% for real-time charting and 34% to 44% on bedside charting (Nelson et al., 2005). The research proved the additional education and feedback greatly improved nurse charting.
Slide 9 for Analysis of Data Reports. To answer the question what are the consequences for the studies if a type 1 or type 2 error was made? We first need to know the meaning of each. A type 1 error show that the hypothesis is true when it fact it is false, showing the study to be falsely successful. A type 2 error happens when the hypothesis is false when it is actually true, which would show the study to be unsuccessful when it is actually successful. Slide 9 for Analysis of Data Reports. If Type I errors were made, ICU would also have a decrease in medication errors.

Medication errors on medical-surgical units would stay the same (Helmons et al., 2009). Slide 9 for Analysis of Data Reports. If Type II errors were made, there would be a false increase in slight decrease. However, according to the article, there was a significant change in medication errors, including the time medications were given and the route in which they were ordered (Helmons et al., 2009).

Slide 10 for Analysis of Data Reports. Type I error is the one everyone tries to avoid. It is the more serious error between Type I and Type II errors (Easton & McCall, 2004). A Type I error is when the null hypothesis is rejected, when it is true. Type I errors are also known as false positives. An example of this would be a false pregnancy test. For this article, there would be too many medication errors, equipment would be misused, charting would not be done accurately (Nelson et al, 2005).

Type II errors are also known as false negatives. This kind of error fails to rejects the null hypothesis (Bennett, Briggs & Triola, 2009). The true results for study 2 is that the real time charting increased as well as the bedtime charting on the study group proving the effectiveness of the extra education. In study 1 the medication errors decreased and medication safety increased with computerized charting (Nelson et al., 2005).
Slide 11 for Analysis of Data Reports. In the first study, data were collected one month prior to the implementation of bar-code assisted medication administration, and three months after the implementation. The data were then compared. The findings were that medication errors decreased overall in the medical-surgical units by 58% after the implementation of the barcode-assisted medication, but not in the intensive-care units. The overall administration time of medication per patient went up in both units (Helmons et al., 2009).

A search was conducted to find if there were any additional studies in the same field that corroborate the results of the first study. Several studies of similar nature were found. The study that most closely resembled the first study was on The impact of a closed-loop electronic prescribing and administration system on prescribing errors, administration errors and staff time: a before and after study (Franklin, O’Grady, Donyai, Jacklin, & Barber, 2007).

Like the first study, the researchers gathered data before and after the implementation of bar-coded-assisted medication administration or what this study refers to as a closed-loop electronic prescribing and administration system. The data in this study were collected between three and six months prior to the implementation, and then collected again between six and twelve months after the implementation. The result of this study was a decrease in the rate of medication errors by 1.8% across the hospital setting. The overall administration of medication time went up after the implementation of the computerized system versus the paper system (Franklin, et al., 2007).

The comparison of the two studies revealed that implementation of a computerized system to help control medication errors does reduce the amount of medication errors made. However, the administration time per patient for each medication went up in both studies. Therefore, the impact of bar-code-assisted medication administration is beneficial in helping to
prevent medication errors, but may not be so beneficial as far as the extra time it takes in order to perform the necessary tasks to carry out the computerized drug administration methods.

Slide 12 for Analysis of Data Reports. In the second study on the Detection and Prevention of Medication Errors Using Real-Time Bedside Nursing Charting (2005), nurses were not properly utilizing the clinical applications of bar-code-assisted medication administration (BCMA) devices resulting in preventable medication errors. Although this study was designed to increase the real-time charting rate of the nurses at bedside to prevent medication errors, it highlighted many workaround errors. The result of this study was an increase in the real-time charting rate of the nurses at bedtime to help reduce medication errors. The rate prior to implementation of education on the subject was 59%, and the rate after implementation of education jumped to 73% (Nelson, et al., 2005). A search was conducted to find if there were any additional studies in the same field that corroborate the results of the first study. Several studies of similar nature were found. The study that most closely resembled the first study was on Workarounds to Barcode Medication Administration Systems: Their Occurrences, Causes, and Threats to Patient Safety (Koppel et al., 2008).

Like the first study, this study gathered data about medication errors, but it was directed more toward workaround errors. These errors were discovered in the first study, but were enhanced in this comparative study due to the significance of these errors. The study found intentional errors performed by nurses to increase speed, and also errors that were shortcomings of the bar-code-assisted medication administrations’ design. While this research was conducted using regular commercial BCMA’s, improvements could be made by having the BCMA specially designed for each facility’s unique patient needs. Medication errors could be
dramatically reduced if the designs of BCMA’s were improvised and custom tailored to each institution (Koppel et al., 2008).

Slide 13 for Analysis of Data Reports. Looking at the two studies used for this project it appears both parametric and non-parametric procedures were used, and each for different reasons. The research also shows that either could have been used in these types of studies. The articles also showed different types of statistical tests such as the T Test, where the results showed the implementation of the BCMA did improve the medication errors on some of the units. The student T test used in study 2 proved that the increase of education and feedback greatly improved the charting versus the control group. Both studies were looked at for hypothesis errors and none were found in either study. There appeared to be no type 1 or type 2 errors made. If type 1 error would have been made then there would have been a decrease in medication errors or the other units and the control group in study 2 would have improved on their charting, this did not happen. Since there was a significant change toward improvement in both studies then there were no type 2 errors made in either study as well.