An Evaluative Study of Piqua Fire Department's Quality Control Program for EMS Run Reports

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CERTIFICATION STATEMENT

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ABSTRACT

This study addressed the problem that there was no formal data determining the benefit, or lack of benefit, to the city of Piqua fire department's quality control program. It was an evaluative study to determine if the quality control system instituted by the city of Piqua fire department made a significant difference in the quality of the EMS runs submitted by crews including how those runs have changed; if any problems persist in the quality or standardization of EMS run reporting; and what parts of the program is or is not working. That would allow for ongoing deficiencies that may need to be addressed to be identified. The program was very contentious throughout the department on initiation, phased in over several years, and justification was provided for the changes required in that time. Research and stakeholders were consulted looking for areas that needed to be addressed and how the improvements should be properly implemented. This resulted in changes within EMS runs that were submitted. To formally assess the changes, the first 100 runs from May of 2010 and May of 2015 were compared for 63 identified errors. An audit checklist of those errors was created and applied against the EMS runs both in hard copy form and in the computer system. The resulting analysis found differences in the number of errors with a significant decrease (t test, $p < .01$) between 2010 and 2015. Run errors were decreased by 93% across all shifts combined. The errors that persisted were irregular and did not indicate any particular problem area. However, one shift could account for a majority of the errors in 2015. There was a limitation to the study regarding sample size. Having a larger sample size would have allowed statistical analysis between the shifts in order to find significant problem areas. Recommendations include ways to properly implement a quality assurance program including multiple tiers for quality checks, proper training, and clear expectations across all ranks.

TABLE OF CONTENTS

INTRODUCTION

Statement of the Problem

The city of Piqua fire department has had ongoing issues regarding patient care documentation and incomplete and unsatisfactory reports when compared against protocols, insufficiently providing information for billing requirements, failing to provide information required by Emergency Management Services Information Reporting System (EMSIRS) reporting guidelines, and unique shift based expectations on what is satisfactory and what is not. This has been problematic for the administrative specialist who has previously been responsible for uploading report requirements, submitting billing, and having to educate individual firefighters to fix continued problems. Fire officers were asked to start checking the EMS reports of their crews before they left each duty day, but there were no set expectations for this process and the problems continued. The lack of accurate, complete, and thorough information in EMS reports has been an ongoing deficiency and has caused numerous problems in utilizing the data for various reporting purposes.

As discussed in the later literature review, the importance of proper emergency medical services (EMS) documentation supports the fire department in several different areas. EMS run documentation provides important continuity of care information when handing off patients to the hospital or other emergency personnel. It allows the fire department to bill for the care they provide bringing revenue in without unnecessary concerns over audits and resulting error reimbursements. It provides legal documentation to support crews and the department from possible litigation which may come years after the run actually took place. It further allows the department to provide accurate reports to city management and third party interests like the International City Management Association (ICMA), Ohio Department of Public Safety via the

Emergency Medical Services Incident Reporting System (EMSIRS), and anyone else requesting run records, data, or other EMS related documentation. Proper run documentation also insures the crews are operating according to their regional protocol, department policies, procedures, and operating guidelines. This adds accountability to the crew and the department in making sure that department staff are doing what they are expected to do given the situation that is encountered. Finally, having standardization throughout the department on the expectations and the quality control process insures every member of every crew is performing in similar fashion every time. This helps solidify and standardize department operations and efficiency since crew members may work on other shifts throughout the year and everyone will face the same expectations and meet the same level of performance. To date there have been lots of opinions on whether the program was necessary but no formal evaluation of whether or not it has worked to improve the quality and standardization of EMS runs in the Piqua fire department has been conducted. The problem this study will address is that there is no formal evaluative data in determining the benefit, or lack of benefit, to the city of Piqua fire department's quality control program.

Purpose of the Study

The purpose of this evaluative study is to determine whether the EMS run report quality control system at the city of Piqua fire department has improved run quality, standardization of report practices throughout the department, and if there are any ongoing deficiencies in reports or problems in the system.

Research Questions

The following questions were answered by this evaluative research:

1. How have EMS run reports changed between the period before and after the implementation of a quality control program for the city of Piqua fire department?
2. What discrepancies in the EMS reports persist following the implementation of a quality control program?
3. What elements of the implemented system are not meeting standards or expectations and require further adjustment, training, or revision in the quality control program?

BACKGROUND AND SIGNIFICANCE

As part of a required project for a paramedic refresher class, the author put together a quality control system for EMS reporting and instituted those changes for the staff under his supervision (only a third of the department). The chief and administrative specialist saw benefit from the instituted changes and asked for the program to expand department wide. The implementation was not without problems and those issues were addressed as they were encountered as discussed below. There was resistance among the various crews as the system was perceived as unnecessary, being intrusive to individual shift management styles, and problematic requiring additional information within reports that had not previously been required.

The resistance from the fire department staff was countered by bringing in third party stake holders to explain the importance of different pieces of the EMS run data. The Ohio Department of Public Safety sent a speaker to discuss EMSIRS reporting, Med3000 (an EMS billing company utilized by the department) sent a speaker to discuss the requirements for billing and the threat/potential repercussions of audits, and further information was obtained from Page, Wolfberg, and Wirth (an EMS industry law firm) regarding documentation that is legally defendable and better protects the department against audits. Problems persisted among

particular department members who claimed they were not aware of the changes after they were implemented, didn't understand the expectations after they had received instruction on how EMS runs should be completed, and/or stating they were given conflicting information. A method was then implemented to track information dissemination, when firefighters were corrected, how often, and the type of errors. It was discovered that several officers were not checking the EMS runs in the manner that was expected of them as well as not holding their crews accountable. At the beginning of 2015, this issue was addressed by instituting another layer to the quality program to check the officer's progress on auditing their crews' run reports.

This study did determine the validity of the quality control effort in the city of Piqua fire department, any problems that might continue to exist in the system, and how the system might be improved. Such an effort was important locally to the department for all the reasons provided. Further, the study can benefit other departments looking for an example of a quality control program, why such a program is important, how one might be implemented, the difficulties that may surface, and how to counter those problems. This study can serve as a start to other department's as they seek to improve their operations, services provided, and record keeping.

LITERATURE REVIEW

The evolution of EMS report writing was summarized by Munger (2000) who explained that EMS reports initially started as an "in-house" document for local departments and their needs. Over time, with the growth of the EMS profession, the need for increased recognition as a distinct field operating as part of the overall health care continuum called for a more thorough patient care document demonstrating that EMS professionals had developed specialized thought processes and prehospital care knowledge. Eventually, a desire and need to collect data began to

emerge for outcomes and other types of research, cost justification, and accountability. The implementation of EMS billing further added to the need for thorough EMS run reports. Illegible handwriting, missing data, inability to track patient outcomes, and lack of uniformity were recognized as recurrent problems that could be better managed through electronic reporting.

Munger's discussion of the evolution of EMS run reports is supported by Newgard, Zive, Malveau, Leopold, Worrall, & Sahni (2011) who explained the need to collect standardized data. Such data is essential for quality assurance, continuing quality improvement, field provider education, public health efforts, research, disaster planning, allocation of EMS programs, and outcome studies. Despite the need, there is a lack of such data and it has been cited as a critical area for improvement in the United States. The authors go as far as to state that requirements should be put in place requiring regular standardized data submissions as part of agency licensing. They discuss agency efforts being necessary in order to increase completeness and consistency in charting, use of National Emergency Medical Services Information System Data Sets, and mandatory field requirements which would improve success at matching records for research. One source of contention among EMS crews is that information entered into the electronic patient care reports discreet data fields (checkboxes and tables) is redundant because the information is also contained in the narrative of the report. The authors note that, while those narratives are important in the field where the work is done, it is difficult to capture data in a free text narrative and would require automated logic to do so. Human review could be used to review information in the narratives but the time and effort required make that strategy unrealistic. Until such time that an automated approach is created to extract information from

narratives, discreet data entry will be required in addition to the narrative (Malveau, Leopold, Worrall, & Sahni, 2011).

The importance of electronic data over manual data is underscored by Newgard, Zive, Jui, Weathers, & Daya (2012). Evaluating electronic versus manual data processing in out-of-hospital research, they found electronic data improved data matching and made possible a much larger case capture improving data pools for research. This was accomplished with little additional time and without compromising data quality. Landman, Rokos, Burns, Van Gelder, Fisher, Dunford, ... & Bogucki (2011) further emphasize the need for electronic prehospital patient care reports that are quality in nature because EMS is not just a component of the health care system but an integral part of it and they feel prehospital documentation should be available across the healthcare delivery system. The authors advocate for an interoperable electronic system of information allowing data to be shared in real time from the 911-call to discharge from the health care system using quality standardized information. With recent priorities in health care information technology and the American Recovery and Reinvestment act, that is where we are heading in the future. Tsai, Choi, Sulivan, & Williams (2013) explain the need for quality EMS run reports by comparing EMS with high reliability organizations like commercial piloting, nuclear power plants, or air traffic control. Within those organizations, breakdown and failure would have catastrophic consequences and quality information sharing is essential. Within EMS, personnel operate unsupervised and in "highly uncertain environments" yet often do not have a quality improvement supervisory presence. Tsai, Choi, Sulivan, & Williams (2013) make suggestions including better standardized data collection.

In considering continuity of care, Waldron & Sixsmith (2014) found that physicians in the emergency department were unaware of the prehospital treatments and medications that were

used after a patient handoff in the emergency department from EMS crews. Much of the information was lost in the exchange which creates a potential for sentinel events (those with serious adverse consequences). A direct verbal conversation at hand-off improved the process but the researchers discuss fewer errors when written or electronic support material was used which underscores the importance of a quality EMS run report. Quality run reports are a primary motivator in agencies adopting electronic patient care reports because improved legibility and quality metrics are easier than with paper reports that are also prone to being lost (Landman, Lee, Sasson, Van Gelder, & Curry, 2012). Those working in emergency care have reported that emergency department reports are often more reliable and easier to read than the reports that the emergency room receives when patients are handed off to them (Gillespie, Gleason, Karuza, & Shaw, 2010). The Joint Commission has recognized the issue of communication at patient transfer to be enough of a problem that one of their 2009 National Patient Safety Goals is to improve the effectiveness of communication including communication at hand off of patient care. Communication at transfer of care to the emergency department has been poorly studied and is often found to be lacking compared to that of other high risk occupations where delicate responsibilities are passed from one to another (Cheung et al., 2010). Cheung et al. (2010) states that a number of factors interfere with the communication including the patient, the team, the environment, the task, caregivers, and local and institutional processes reinforcing the need for a thorough handoff. They further provide some possible models to improve communication including mnemonics, computer aided reports, and instituting quality measures. Quality reporting at patient hand-off improves patient care and safety, a fact that is recognized and endorsed by the National Quality Forum. Further, it is being considered by the Center for Medicare and Medicaid as being one of the items that future payment for reimbursements will

hinge upon (Klinger & Moscovice, 2012). If health care facilities, and those organizations that transport patients, do not ensure adequate steps are taken to insure proper communication is occurring through a quality EMS run report, it could potentially impact their revenues in the future.

EMS billing allows departments to collect revenue for the services they provide. However, if the runs are not complete, do not justify the billing, or are not submitted in a timely manner due to errors, the billing may not be successful, collected monies may need to be returned, or reimbursement may be locked up in an audit situation while an appeals process is completed. Crawford (2009) discussed the case of Douglas Moore, a Dallas City Auditor, who filed a whistleblower lawsuit against the Dallas, Texas Fire Department. The department was billing for advanced life support runs for which Medicaid/Medicare pays a higher rate for every 911 call despite there only being documented support for basic life support billing of a lower rate. Dallas settled the lawsuit with the federal government for $2.47 million dollars while admitting no wrongdoing. Had the suit gone to trial, the city may have had to pay $40 million. Since the city auditor discovered and reported the fraud, he may be entitled up to 30% of the recovery. Moore (2011) explains that an ambulance company is near bankruptcy after being audited by a Medicare Recovery Audit Contractor. The contractor pulled 30 claims and found a 94 percent error rate, something the company's attorney says were "small, small, documentation errors". The attorney states contractors get a commission on what they discover and can go back as much as four years giving them an incentive to find every error they can. The article comes with the suggestion that the best offense is a good defense because if auditors find little wrong with an agency's billing practice they have little reason to continue looking. Another article discussed Medicare doing duplicate audits on some organizations (Kennedy, 2014). One

company had $200 million dollars locked up during appeals and won all but about a quarter of the alleged improper payment claims. However, all the money was held until the audit process was complete. Quality control is important in billing to prevent audits from haunting an organization especially in light of the fact the rules are constantly changing. Some recent changes include requiring mileage to be reported to the tenth of a mile as opposed to rounding up, reimbursements amount modifications, changes to the ambulance inflation factor, and imposing a 12 month time limit on billing allowing Medicare to deny late claims after that period has passed (McCallion, 2011). The International Association of Fire Fighters (IAFF) understands the importance of run report quality in a technical document it provides to its members when attempting to collect revenue. They state "Getting paid for services delivered often depends on field personnel's ability to collect and document billing information. This is the first step in successful collection. The local provider should see that field personnel are properly trained in documentation procedures" (IAFF Monograph 4, 1997, page 7).

Regarding litigation defense, the EMS run report has long been accepted as the best method of protecting EMS crews and organizations from lawsuits. Harrawood, Shepler, & Gundersom (1995) explain that EMS crews are exposed to risks every day and the severity and frequency of those risks are increasing requiring risk management. They discuss the EMS system's responsibility to their communities to provide timely and competent care and how negligence results when our crews' conduct falls below established standards of care. At the same time, the media covers anything significant that EMS agencies are part of which increases agency exposure while the public has an increased awareness of what the expectations are regarding performance. That has helped fuel an increase in medical negligence claims in the area of evaluations, treatment, choice of destination, and in refusals of care. When those claims

occur, attorneys will examine everything pertaining to their client starting at the 911 call. Anything not documented will be presumed not to have occurred. In addition, the attorney will make a strong case that the legibility and completeness of a patient's care record is likely to be representative of the quality of care that the patient received. Failure to have quality control or quality improvement measures in place will come to vex organizations that face such a situation. Shine (2010) emphasizes that reliability on immunity statutes for protection in EMS only goes so far. EMS personnel are not protected in the instances where they are grossly negligent, reckless, or demonstrate willful and wanton misconduct. Examples shared with the reader include a paramedic obtaining a refusal from a patient after an altercation. The crew did not chart anything showing that they checked for abnormalities in blood pressure, pulse, skin color, moisture of the skin, or anything else related to shock. The patient later died and the crew was found to be liable for negligence by the court hearing the case. Another example included a woman calling 911with an asthma attack but no one answered the door on arrival. The crew left without any further attempts to make entry. She was later found dead and it was ruled by the court that there was sufficient evidence to allege that the crew demonstrated willful and wanton misconduct. Proper documentation could have provided protection in both instances. The International Association of Fire Fighters (IAFF) also discusses the importance of EMS run report quality in a technical document that it provides to its members. They state "EMS providers must pay strict attention to patient run report documentation. A properly documented run report can diffuse potential lawsuits" (IAFF Monograph 3, 1997, page 6).

When considering the number of third party groups that are interested in fire and EMS related data, and the uses for those data, the list is long (Kemp, 2009). Fire departments have to generate reports within the department, to city hall and the local governing body, share

information with other departments, produce information to regulatory and rating agencies like the Insurance Services Office, and so on. In addition, fire departments often wish to compete for grants or influence legislation at the state and federal level which usually requires information to support the department's position or to explain a need. Some departments report information for comparisons through the International City Manager's Association (ICMA) in order to determine how effective they are and how they stack up against similarly sized, staffed, or financed departments in a host of equipment or operational areas. EMS run reports help generate data for all these areas. Another important third party interested in data that fire departments generate in EMS run reports is the National Emergency Management Services Information System (NEMSIS). Jacobson (2011) explains the importance of EMS data to NEMSIS for research and its similarity to the National Fire Incident Reporting System (NFIRS) on the fire response side of fire department business. Those interested in NEMSIS, the program benefits, data sets used, data reports, and so on, have a host of tools and resources available to them at the NEMSIS website at www.nemsis.org.

Protocol, department standard operating guidelines (SOGs), and standard operating policies (SOPs) should all be guided by the results of our efforts. What works, what does not? Without looking at EMS run data, departments do not know if what they are doing actually makes a difference (Kemp, 2009). Erich (2012) supports that assertion stating the data are important in understanding the types of calls agencies are going on, and what are the trends in an agency's service delivery. Otherwise, agencies are just doing what has always been done with no basis for the methods they practice. Having an empirical basis for the things agencies do will become increasingly more common and is already being applied to doctors and hospitals in pay for performance measures (Kemp, 2009). Patient outcomes and cost effectiveness have received

little attention in EMS applications and is one of the key areas garnering attention in the document *Emergency Medical Services: Agenda for the Future* (National Highway Traffic Safety Administration, 2010). The need to be able to evaluate and determine the effectiveness of interventions that EMS agencies use to find those that provide for the best patient outcome, highest quality of care, and the most efficient method of providing their services is also echoed in the Federal Interagency Committee on EMS's Strategic Plan. It is also a goal of regional associations, like the Greater Miami Valley EMS Council, who create the regional protocol that prehospital providers in their area utilize (The Greater Miami Valley EMS Council, 2011). Protocols are evaluated by standing order committees in the council and changes are implemented based on findings throughout the year, research, and input received from members. The council also encourages quality control checks and provides excel forms for in-house quality review to insure EMS runs include what is required in regards to protocol for the run type.

Finally, as emphasized in other EMS run areas considering local and regional needs for improvement, there is an overall need and desire to bring EMS run data to a higher level in quality and standardization nationwide so that it is in line with the rest of a patient's medical record. Baumlin, Genes, Landman, Shapiro, Taylor, & Janiak (2010) make several recommendations that would lead to improved quality of care including all relevant information being properly captured and available from a 911 call, transport to a hospital, discharge, and outpatient treatment. This information should then be made available across the entire health care system. In doing so, the authors feel that care coordination will get better, outcomes will improve, and there will be a reduction in health care spending. Seymour, Kahn, Martin-Gill, Callaway, Angus, & Yealy (2014) expand on the importance of proper data collection on a wide scale when discussing the importance of data matching for large research tools such as NEMSIS.

Those authors cite problems in data collection including missing or suspect data quality which is crucial to data matching and research success. Without it, matching patient records through various information "silos" is impossible. The International Association of Fire Fighters (IAFF) recognizes the importance of quality in EMS data collection in their Monograph on adding value to a fire-based EMS System (IAFF Monograph 3, 1997). They discuss ongoing quality improvement through several pages starting with the explanation that a quality improvement system helps departments justify what they do and increases effectiveness. They summarize with the statement that "having a continuous evaluation tool adds credibility and value to a fire-based EMS system" (IAFF Monograph 7, 1997, page 13).

In summary, many different data sets are used for many different purposes but all coexist within an EMS run report. All of them require strict quality standards, monitoring, and standardization to insure the necessary information required is within each and every report. All of the identified areas of concern require attention including continuity of care for the patient being transferred to a hospital; EMS billing allowing for revenue collection for the department; preemptively creating the best possible legal defense in case it is needed; third party reporting to department heads, local governments, legislatures, and for grant submissions; protocol, SOG, and SOP reviews and changes; and local, state, and national research. They all have significant but distinct pieces at stake within an EMS run report. All of them require due diligence on behalf of every member of the department completing EMS run reports. This requirement necessitates a sound and very thorough quality control process, a process that starts at an organizational level.

Having reviewed the literature, several items stand out as important when it comes to insuring quality EMS report documentation and several steps required in setting up a quality

control program (Kemp, 2009). First, all the potential relevant stake holders in the information generated by EMS runs need to be identified, along with what pieces of information are important to that particular stake holder. Second, EMS report software programs need to be set up in a way that allows for the required information to be captured. Third, the information should be standardized and the information captured the same way by everyone, on every shift, within the organization. Training should be provided to organization members and then a system of regular checks completed to ensure the training has been utilized. Finally, regular updates should occur to insure information and practices are current. This study will use this information as a guide to identify the important data that should be captured and evaluate how well these items were captured across all three shifts before and after the implementation of a quality control program.

PROCEDURES

This study seeks to formally address the following questions:

1. How have EMS run reports changed between the period before and after the implementation of a quality control program for the city of Piqua fire department?

2. What discrepancies in the EMS reports persist following the implementation of a quality control program?

3. What elements of the implemented system are not meeting standards or expectations and require further adjustment, training, or revision in the quality control program?

To address these questions, EMS run reports previous to the implementation of the EMS quality control system, which seeks to insure quality assurance, will be reviewed and compared against EMS run reports after the quality control system was implemented. For the purpose of this report, the first 100 EMS run reports will be reviewed from May 2010 and May 2015 for

errors listed in the EMS Audit Issues Sheet Key (Appendix 1) and those errors found tracked using the EMS Audit Error Track Page (Appendix 2). The EMS Audit Issues sheet contains numerous noted errors that existed in the city of Piqua fire department EMS reports and necessitated the need for a quality review program initially.

To do this evaluative study, the hard copies of the EMS reports in storage were removed and sorted. The reports, at the time they were stored, were merely boxed with no system as to how they should be archived. Runs were sorted from the first of the month to the last day of the month and married to their corresponding signature sheets if not already done so. Once the sorting was completed, the evaluation was begun. After the hard copy and signature sheets were checked, the reports were checked against the computer to insure data entry matches what is on the hard copies and signature sheet.

During evaluation, runs were taken one at a time and assessed against the EMS audit issues sheet looking for errors. The number of errors was tracked on each report and each shift tracked on the number of errors that exist for their crew for standardization purposes. At the end of the data collection, the number of errors from 2010 was compared to the number of errors in 2015 to determine the effectiveness of the City of Piqua quality review program. The answers from the data collection not only determined effectiveness, but identified persistent problems areas and what standards, and/or expectations require continued adjustment, training, or revision.

Definition of Terms

Quality: The adjective quality applies to objects and refers to the degree to which a set of inherent characteristics fulfills a set of requirements. An object is any entity that is either conceivable or perceivable and an inherent characteristic is a feature that exists in an object (Praxiom Research Group Limited, 2015).

Review: A review is an activity. Its purpose is to figure out how well the thing being reviewed is capable of achieving established objectives. Reviews ask the following question: is the subject (or object) of the review a suitable, adequate, effective, and efficient way of achieving established objectives (Praxiom Research Group, 2015)?

Limitations of the Study

A possible limitation in the study is one shift's runs in the 2015 year portion of the study had less than the desired minimal sample size of 30 usually wanted for doing statistical analysis. Stretching the number of runs further into the month of May would have allowed for each of the shift sample sizes from both years to be greater than thirty and allowed for shift to shift statistical comparison to see if significant differences existed between the shifts.

2010	Shift 1	33	2015	Shift 1	33
	Shift 2	33		Shift 2	41
	Shift 3	34		Shift 3	26

Table 1. *Number of EMS runs broken down by shift in May of each respective year.*

RESULTS

There was a reduction in the number of errors found in EMS runs when comparing EMS runs from 2010 with those from 2015 (see figure 1). Descriptive statistics and a t-test were completed on the findings to check if there was significance in the difference.

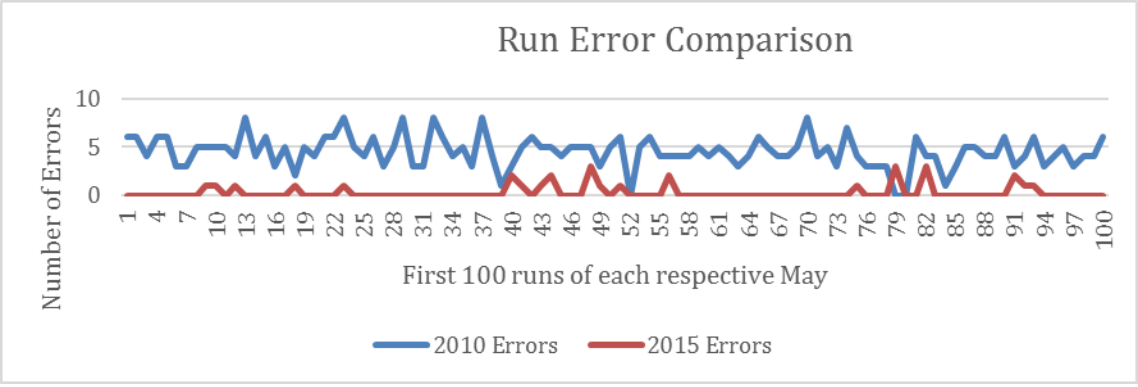

Figure 1.

Improvement at a glance in the reduction of errors between 2010 and 2015

For the first 100 reports in May of 2010, a total of 448 errors were found giving an average of 4.48 errors per report. The mode was four, the median was four, and the range in the number of errors was 0-8. There were two reports with 0 errors and both were calls were the medic was disregarded prior to making patient contact. The standard deviation for 2010's reports was 1.63.

For the first 100 reports in May of 2015, a total of 29 errors were found giving an average of .29 errors per report (a 93.5% decrease in errors). The mode was zero, the median was 0, and the range was 0-3. The standard deviation for 2015's sample was 0.69.

To test for significance in the differences between the numbers of errors found in 2010 (before a standardized quality review system was put in place) with the errors found in 2015 after a standardized quality review system was put in place, a two tailed T-test was done. A two-tailed T-test was chosen because we did not want to presume to know whether 2015 would be better or worse than 2010. Significance for the purpose of this study is a result of less than .05. The resulting t-test was 5.2 E-60, a very small number. That indicates that the decrease in the number of errors found when comparing 2010 and 2015 EMS run reports is significant.

When looking at the errors by shift, all three shifts made improvements by reducing the number of errors found on their EMS run reports (see figure 2). Shift one dropped from 159 errors found in 33 runs in 2010 to 4 errors in 33 runs in 2015 (a 97.5% decrease). Shift two reduced the number of errors they made from 152 errors in 33 runs in 2010 to 22 errors found in 41 runs in 2015 (an 85.6% decrease). Finally, shift three lowered the number of their errors from 137 errors in 34 runs in 2010 to 3 errors in 26 runs in 2015 (a 97.8% decrease). Statistical analysis was not performed between the shifts due to a sample size smaller than the cut off of 30

for one of the shifts in 2015. However, examination of the portion of errors each shift was responsible for went from appearing proportional in 2010 to one shift appearing to own a greater share in 2015 (see figure 3).

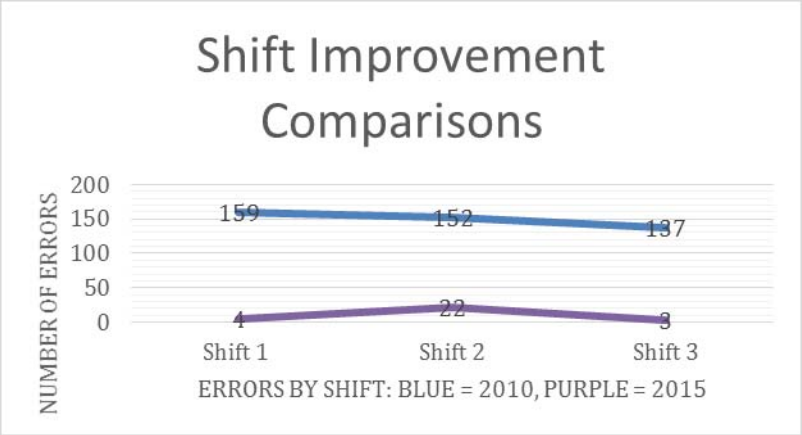

Figure 2.

Run errors by shift in both 2010 and 2015

In figure 2, the blue line shows the number of errors for each shift in 2010 while the purple line shows the number of errors for each shift in 2015, after the implementation of the quality control program.

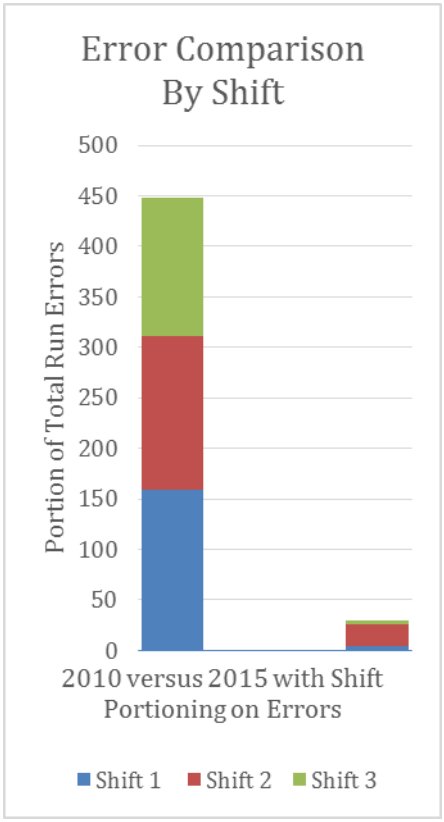

Figure 3.

Proportion of errors for each shift in 2010 and 2015

The first column shows the total number of errors divided by shift in 2010 (blue is shift ne, red is shift two, and green is shift three. The second column shows the same information for 2015. Note the higher proportion of errors on shift two in 2015. Although a higher proportion, due to the sample size being under 30, no test was done for significance of that difference.

DISCUSSION

The results of this study support previous findings that implemented quality control systems do work in improving run quality, standardizing the information being captured, and insuring complete and accurate reports (Newgard, Zive, Malveau, Leopold, Worrall, & Sahni, 2011; Tsai, Choi, Sulivan, & Williams, 2013; Baumlin, Genes, Landman, Shapiro, Taylor, & Janiak, 2010). EMS report errors were significantly reduced at the city of Piqua fire department

after implementation of a standardized quality review program with several layers of checks (firefighters checking their own runs, officers checking their firefighters, and occasional spot checks of the officers' success in checking their firefighters work, and the administrative specialist's review before EMSIRS and billing submissions).

Discrepancies still persist in that errors are still being committed. However, the discrepancies are diffuse and no single pattern exists that helps in identifying a single trouble area. Occasional reminders, retraining, and consistent feedback will help keep EMS run reporting the most successful in meeting expected standards.

While no one problem area was identified, there is one shift in particular that appears to be making a disproportionate number of the errors that continue to be found. This may be alleviated by retraining the shift as a whole, or the two officers on that shift at a minimum, to insure they are checking their crews work and providing feedback in an adequate manner. Further, providing post training tests after any reporting education is provided regarding the quality control standard will help to insure that the desired content was received and understood. This would allow any weak areas to be noted and dealt with before the training is completed.

The results support having a quality review program despite initial negativity when the program was implemented. The experience, however, showed the importance of having multiple layers to such a program. Firefighters should check their own work before submission, officers need to check their assigned firefighters' work, and a quality control manager needs to routinely audit the officers' work to insure everything is being done consistently and to the established department standard. Otherwise, weaknesses in the program may persist or go unnoticed.

The city of Piqua fire department will benefit from having improved and standardized EMS run reports. Billing will be supported and the department will be well guarded against third

party audits. Each shift will have and be expected to meet the same expectations preventing confusion. The department can insure that assigned personnel are operating according to their scope of practice and regional protocol. Reporting for EMSIRS and NEMSIS purposes meets the requirements and provides complete information for research purposes. Finally, the department is protected from potential lawsuits being able to adequately account for the patient's condition, interventions, and handling of care throughout transport to the transfer of care at the emergency department.

RECOMMENDATIONS

Future readers' efforts into examining EMS run reports in the city of Piqua fire department should expand the number of runs compared from one year to the next. This would insure sample sizes are large enough for shift to shift statistical analysis and to determine if significant differences exist between shifts.

Any department that wishes to learn from the city of Piqua fire department's experience in implementing a quality control program would be benefited by insuring that the program has multiple layers of checks rather than just one.

When educating personnel on the standard and expectations regarding EMS run reports, post training testing will help identify weaknesses to insure everyone understands the expectations.

Further, departments might consider looking into other departments to determine what is similar or different in the various quality control programs. Learning from one another, and our successes and failures with what has been attempted, will allow for continued improvement in perfecting our EMS documentation and the way EMS professionals capture information.

Finally, researching what worked will help departments skip steps and hurdles that may hinder implementing a quality control program and therefore foster implementation success.

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APPENDIX 1 – EMS AUDIT ISSUES KEY

Area	Portion	Problem
ATS	Patient Billing	No patient signature indicated.
		Billable not checked as run dictates.
		Attachment – Dispatch/Signature Sheet scanned into wrong area or missing.
ATS/Report	Incident Characteristics	District incorrect.
	Incident Location	Address format incorrect.
	Info I/II/Trauma/Cardiac	No alcohol use indicated when in narrative.
		No refusal information indicated when run was a refusal.
		Tabs blank when they should be marked.
		Primary and secondary are the same.
		Transport information incorrect.
		Hospital information/determination not accurate.
	Hx/Meds/Allergies/Vitals/Tx/Attch	Allergies blank.
		History blank.
		Medications blank.
		Conflicting information entered.
		No alert in vitals for refusal.
	Apparatus / Crew	No reporter indicated.
		No apparatus assigned.
		No personnel assigned.
		Personnel assigned in wrong area.
		Incorrect Apparatus Listed.
	Interventions	No assessment listed.
		No pulse ox listed.
		No vital sign assessment reported when vitals listed.
		No EKG when results listed in vitals.
		No medication listed as administered when was applied per narrative.
	Narrative	No EKG assessment reported when listed as an intervention.
		No EKG when results listed in vitals.
		No vital sign assessment reported when vitals listed.
		Medication administered not reported or reported incorrectly.
		Vitals not quantified, described, or listed.
	Address	Incorrect Resident Status to address.
		Incorrect patient address.
		Incorrect incident address.
		Incorrect Census Tract.
		Incorrect district.
		Address not entered correctly.
Report	Narrative	Unclear narrative.

Signature Sheet	Common Signature Sections	No transport date.
		No employee number.
		No run number.
		No patient name.
		Incorrect signature box completed.
	1st Section	No date of patient signature.
		No witness signature date to an illegible patient signature.
		No witness to an illegible patient signature.
	2nd Section	Check boxes blank.
		Reason blank.
	3rd Section	No hospital location.
		No time at facility.
		No title to receiver.
		No date to receiver signature.
		No title to paramedic.
	Refusal	No check boxes for refusal type indicated.
		No age check box indicated.
		No checks in appropriate LOC warnings.
		No witness to signature.
		No date to signatures.
		No, or incorrect, checkbox indicating person signing form.
		No vehicle identified.
General	General	Description:
		No audit done.
		Run miss-numbered.

APPENDIX 2 – EMS AUDIT ERROR TRACK PAGE

Area	Item	Portion	Problem																								
		Run Number / Shift =																									
ATS	1	Patient Billing																									
	2																										
	3																										
ATS/Report	4	Incident Characteristics																									
	5	Incident Location																									
	6	Info I/II/Trauma/Cardiac																									
	7																										
	8																										
	9																										
	10																										
	11																										
	12	Hx/Meds/Allergies/Vitals/Tx/Attch																									
	13																										
	14																										
	15																										
	16																										
	17	Apparatus / Crew																									
	18																										
	19																										
	20																										
	21																										
	22	Interventions																									
	23																										
	24																										
	25																										
	26																										
	27	Narrative																									
	28																										
	29																										
	30																										
	31																										
	32	Address																									
	33																										
	34																										
	35																										
	36																										
	37																										
Report	38	Narrative																									
Signature Sheet	39	Common Signature Sections																									
	40																										
	41																										
	42																										
	43																										
	44	1st Section																									
	45																										
	46																										
	47	2nd Section																									
	48																										
	49	3rd Section																									
	50																										
	51																										
	52																										
	53																										

	54	Refusal																								
	55																									
	56																									
	57																									
	58																									
	59																									
	60																									
General	61	General																								
	62																									
	63																									