



## MCHD Improves EMS Operation with Integrated Data Management Technology and Attains Measurable Process and Quality Improvements

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### Installation Profile

Montgomery County Hospital District (MCHD) provides award-winning EMS and pre-hospital care services for a growing population of 325,000. Located outside Houston, the organization handles 28,000 medical calls a year, operates a fleet of 24 ambulances (of which 14 are staffed and ready 24 hours a day), and transports 17,800 patients a year.

**Problem:** Time-consuming paper-based processes, missing and inaccurate information, and billing delays were hindering the quality of patient care MCHD wanted to provide, as well as negatively affecting the productivity of its work force. Increasing regulations were also presenting a challenge.

**Solution:** MCHD knew electronic data collection and management technology was the key to achieving operational and clinical objectives for quality and efficiency, and for supporting quality improvement initiatives mandated by the board of directors.

Using a staged approach, MCHD implemented Zoll Data System's RescueNet suite of integrated data management products for EMS and armed their 150 field employees with laptops and mobile data communications as part of continuing process improvement activities.

#### **Benefits:**

- Improved clinical documentation
- Improved quality of service
- Increased cash flow
- Increased efficiency
- Centralized reporting
- Improved accuracy and confidentiality of patient records
- Enabled regulatory compliance

### **Company Overview**

Montgomery County Hospital District (MCHD) is a political subdivision of the State of Texas. MCHD was commissioned by state law in 1977 to ensure every eligible resident of Montgomery County had access to adequate healthcare services, especially the poor and indigent. Since that time, MCHD has expanded to provide Emergency Medical Services (EMS), community and professional educational programs, and indigent care for those that meet the poverty guidelines set in statute.

MCHD is a vital part of the public health care system in the county. MCHD has a long history of providing excellent pre-hospital care for the citizens and visitors of Montgomery County. In April 1998, MCHD stepped up its role as an EMS provider and, since then, has evolved into an award-winning service model that is recognized worldwide.

### **Situation**

#### **Balancing Quality Initiatives with Operational Efficiency**

After years of negative economic conditions, budget constraints, and procedural red tape, MCHD's EMS program had suffered, as had the entire industry. In 1998, the MCHD board of directors committed to restoring the program by raising standards and setting a series of quality improvement initiatives. They hired a new leadership team and gave them three goals:

- Provide prompt, high quality care for the citizens of Montgomery County
- Execute emergency medical services in the most cost effective manner possible
- Ensure accountability by measuring outcomes and learning from decisions and actions taken

Headed by Allen Johnson, an EMS veteran with a passion for innovation, MCHD's EMS management team took the board's mandates to heart.

"We worked tirelessly to create an organization in which the mandates were satisfied and a balance between top quality care and organizational excellence would be achieved," said Mr. Johnson, MCHD EMS Director.

#### **Identifying Paper as the Culprit to Inefficiency**

As they searched for the critical areas of inefficiency, the team quickly identified the root cause of the problem — paperwork. It was clear that disconnected paper-based processes and systems were lowering staff productivity, slowing transport scheduling and response times, affecting billing and cash flow, making it difficult to keep pace with evolving government regulations, and hindering clinical quality improvement.

## The future of EMS — integrated data management

With more than 80 percent of EMS agencies using computerized databases to enter clinical data, and a growing percentage adopting mobile and handheld devices, integrated data management is poised to revolutionize the EMS industry.

Other trends that are changing the face of EMS and creating the need for integrated document management systems like RescueNet include:

### **More powerful, less expensive technology**

As technology becomes more sophisticated and the price of it continues to come down, there is a point when switching to an automated, technology-driven system becomes the most cost-effective thing to do.

### **Increasing regulations**

As HIPAA and other regulations come into effect, they require electronic methods to ensure data integrity, security, and ease of compliance. Automated systems can reduce duplication of effort and simplify data sharing among all parties – from operations to billing to management and ownership.

### **Budget constraints**

Every organization has been affected by the economic downturn, and more and more positions are being eliminated or merged. However, public safety must not be hampered and organizations must continue to run as efficiently as ever. Automating the data collection process increases efficiency and improves accuracy. Subsequently, organizing and centralizing the data allows for easy, thorough, and flexible reporting that provides management with the critical information required to evaluate and improve business processes and procedures.

According to Johnson, MCHD needed an automated solution that would:

- **Accelerate transport response** —Complex radio transmissions and outdated maps due to rapid growth slowed response time to calls and negatively affected patient care.
- **Improve communication between dispatcher and medic** — To track calls and answer inquiries, dispatchers had to constantly call medics for status and information. This was inefficient and hindered customer service.
- **Capture and access data during transport** — Cumbersome manual processes did not encourage field personnel to complete charts in a timely fashion. Often paper information got lost, confused, or destroyed before it could be completed and turned in to billing.
- **Reduce billing delays** — The flow of information from the field to billing was slow and the error rate was high. Data entry, reconciliation, and auditing bills were extremely time-consuming, lengthened billing cycles, and reduced cash flow.
- **Limit risk of liability** — Paper-based information and manual processes were putting MCHD at risk of violating HIPAA (Health Insurance Portability and Accountability Act) and other regulations that require automated methods to ensure data integrity and security.
- **Measure outcomes** — With no way to retrieve medic statistics, data mining could not be conducted to identify process improvements and trending.

If these challenges could be resolved, the company could meet its goals of improving patient care, optimizing staff productivity and achieving full regulatory compliance.

## Solution

### **Integrated Data Management for EMS**

MCHD turned to ZOLL Data Systems (formerly Pinpoint Technologies) to help them achieve their patient care and quality improvement business goals. The Boulder, Colorado-based software company has been providing EMS software solutions since 1993. Its mission — to develop a complete and integrated data management system that gathers and centralizes information to improve EMS business and clinical operations — was realized with its acquisition in 1999 by ZOLL Medical Corporation, one of the leading manufacturers of cardiac resuscitation devices.

That same year the company launched RescueNet™, a suite of applications that incorporate the entire pre-hospital chain of events into a single EMS system. Its open, Windows-based architecture provides MCHD with seamless integration and interoperation with existing business systems, as well as scalability, and flexibility.

“Early on, we recognized that data management is the future of the EMS industry,” said Mr. Johnson. “Our vision was to marry all the processes – from the 911 call, to dispatch, to patient care, to billing, operations, reporting, and clinical analysis. RescueNet was the only data management system that fulfilled that vision.”

## Timeline

Here's a snapshot of the staged implementation of EMS data management at MCHD. As each product was added the benefits have increased, because the data is entered once and then available to all authorized system users.

- 1997 — Westech (predecessor to RescueNet Field Data for PC) is installed with third-party dispatch and billing systems.
- 2000 — RescueNet Billing replaces former billing system; MCHD requires all medics to use RescueNet Field Data for PC to close calls in the field, ensuring a paperless patient care record.
- 2001 — ZOLL M Series defibrillators running with RescueNet Code Review replace previous equipment.
- 2003 — RescueNet Dispatch replaces previous non-integrated dispatch software. RescueNet Dispatch is interfaced to a local GIS database for street/facility geocoding. RescueNet Dispatch is also interfaced to local 911 ANI/ALI equipment and ProQA EMD/EMD/EMD for protocol-driven call taking and Quality Improvement (QI). RescueNet Mobile is installed in ambulances and supervisor vehicles.

The MCHD EMS solution consists of:

- RescueNet Dispatch (formerly RightCAD)— computer-aided dispatch
- RescueNet Mobile (formerly Nomad)— mobile data communication with Truck PC
- RescueNet Field Data for PC (formerly Westech, then EMS Pro)— field data collection using Panasonic CF-28 laptop computers
- RescueNet Billing (formerly Sanitas) — billing and collections
- RescueNet Code Review (formerly ZOLL Data Control) with ZOLL M Series — advanced defibrillator monitor

With its integrated data management system in place, MCHD now schedules and manages transport requests quickly and efficiently. The graphical dispatch board allows MCHD dispatchers to drag and drop to easily assign the appropriate vehicle, automatically provide accurate patient information to the team, provide mapping, and real-time vehicle tracking.

The MCHD medic crew is alerted to the call on their onboard EMS mobile data communication terminal. They have all the information they need to respond quickly. Information is secure, accurate, time-stamped, and available electronically via wireless technology. The crew can also query and access existing patient information in the database and communicate with the dispatcher in real time.

The system keeps the dispatcher in the loop as to when the vehicle is enroute, at the destination, or at the hospital, so dispatchers always know the status of the call and they can answer inquiries quickly.

On the scene, the crew uses the ZOLL Medical Corporation M Series defibrillator for both medical treatment and field data collection. The procedures are time stamped as they occur so charting begins immediately, and the information is legible and complete. The patient is monitored with the ZOLL defibrillator. Upon arrival at the hospital, the defib data and ECG strips are automatically integrated with the laptop chart information to create the patient care report, which is then printed from the laptop and left at the hospital with the patient.

The completed chart is sent back electronically to the database where it is added to the central patient record. The information is now available for billing — there's no re-keying of data, no waiting for paperwork.

The RescueNet billing software verifies the transport and audits the billing details (set payor, ensure proper charges, etc.) Claims are transmitted via proper electronic standards (ANSI, etc.) to the payor. In addition, the data is available for reporting, education, benchmarking, and performance analysis as soon as the record hits the server.

The system also provides complete, accurate, and secure records for legal and regulatory concerns.

“RescueNet incorporates the entire pre-hospital chain of events into a single, closed-loop process,” said Kelly Curry, Quality and Resource Director. “The integration of dispatch, mobile communications, and the defibrillator is exactly what we wanted and provides the data required to operate as efficiently as possible. The system impacts 100 percent of our daily activity and the resultant process improvements and savings are measurable and cost justified.”

## MCHD Data Vision

*Through data integration, MCHD will improve the accuracy, efficiency and availability of information while reducing cost and workload and increasing revenue and accountability.*

## Summary

The reliability and cost-effectiveness of the wireless data management technology helps MCHD dispatchers to schedule calls more quickly and ambulances to respond to callers faster. Mobile access to patient information also allows medics to provide better care during transport. And, the integrated patient report that includes all the patient information means there's less chance of vital EKG and assessment information getting lost on the way to the destination hospital.

"Integrated data management meets key parts of our vision and transformed our business," said Mr. Johnson. "It allows us to provide award-winning patient care, improves profitability, provides us with critical information in real time, and empowers our employees to do a better job through its innovative technology.

"Even more impressive, it allows us to learn from our experiences, share those outcomes, and ultimately build a stronger EMS industry," concluded EMS Director Allen Johnson.

## Lessons Learned

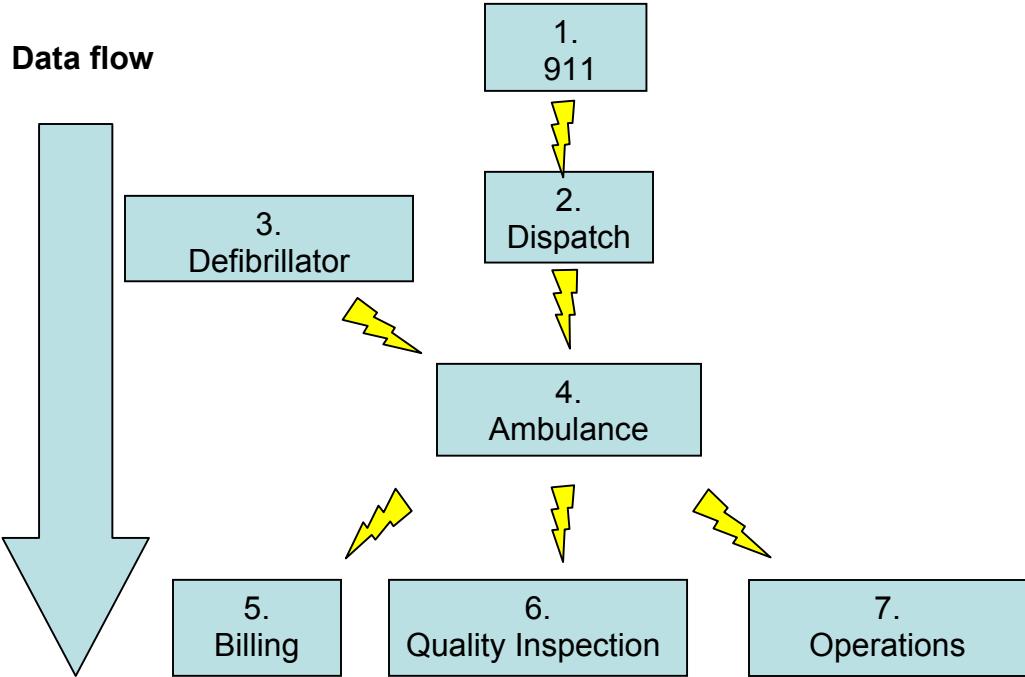
The MCHD team learned some critical factors to success along the way that could help other organizations with similar implementations.

"The biggest recommendation I would make is to provide a richly functional software solution, hardware that is powerful and fast enough to process data quickly, and adequate technical support," said Mr. Johnson. "If you don't do it right the first time, your staff will balk, you'll lose them, and you will never get a second chance."

According to Mr. Johnson, other lessons learned include:

- **Use phased approach to implementation** — "We rolled out the EKG hardware, new laptop platform and patient care software in the same week. It was too overwhelming. Next time, I would do it incrementally, giving people time to adjust and get used to the changes slowly."
- **Provide realistic training** — Offer shorter, multiple, hands-on sessions over time, not just one or two big ones at first. This way, the staff can slowly master the basics, and then tackle the advanced features once they are more comfortable with the new system. Constant, constructive feedback is essential.
- **Take into account the learning curve** — The information will not be viable until EMS personnel learn the tool and how to chart properly.
- **Support your new technology** — Expect to spend ten percent of your initial hardware and software purchase price for annual support, as you would to maintain any business asset.
- **Plan for disaster recovery** — To avoid catastrophic downtime, have backup at the server and also at the machine level. MCHD used flash memory cards in the field data devices to ensure no data was lost in the event of a catastrophic hard disk failure. Additionally, they maintained an inventory of spare laptops to ensure no ambulance would ever be without the field data system.
- **Provide back-up data entry policies** — If the field data computer fails, you have to put a policy in place that mandates employees must go back and enter the data electronically once they regain access to the computer. Otherwise, you will never get away from paper records.
- **Demonstrate the data collected is vital** — If you are going to ask field personnel to collect the data, then you need to show them that you are using it to provide better patient care. This promotes faster buy-in and boosts morale.
- **Include everyone** — Make sure you involve everyone who will be touched by the changes early in the planning stages of the project.

### Data Flow by Function



- 1. 911
  - ANI/ALI automatic data population
- 2. Dispatch (RescueNet Dispatch)
  - Data from 911 is populated into CAD
  - Accurate geo-coding
  - AVL with response recommendation
  - Mobile data shipped
- 3. Defibrillator (M Series with RescueNet Code Review)
  - M Series provides time-stamped charting function
  - RescueNet Code review transfers data
- 4. Ambulance (RescueNet Mobile, RescueNet Field Data for PC)
  - All dispatch data dumps into PCR
  - GIS mapping on RescueNet Mobile
  - Real time, automatic data capture on RescueNet Mobile and Field Data devices
- 5. Billing (RescueNet Billing)
  - No duplicate data entry; already entered earlier in process
  - Immediate access to information in central RescueNet SQL data base
  - Automatic processes
- 6. Quality Inspection
  - No data entry; already exists in RescueNet SQL data base
  - Immediate access to data base
  - Detailed data mining
- 7. Operations
  - Data available for service inquiry, systems analysis
  - Immediate access to clinical data (including ECGs)
  - Detailed data mining/research investigation
  - Automatic processes

## A Metric-based Strategy for Quality Improvement

“You can’t manage what you can’t measure” is the oft-stated philosophy of MCHD quality manager Curry. “Quality is not about being good; quality organizations are the ones that know their weaknesses and put together strategies to improve them.”

Measurements are a way of life at MCHD. The Key Performance Indicator (KPI) methodology is a business discipline that uses objective analysis to chart business process improvements. Most commonly employed by large consulting companies such as PricewaterhouseCoopers and McKinsey & Company, the KPI methodology takes before and after measurements of business operations.

The MCHD “After RescueNet” benefits were a result of both the use of RescueNet software and business process changes. The organization expects to continue improving the “After” results in a number of business areas. As an example, the Days to Bill have decreased from two weeks to five days. MCHD expects to continue to reduce the time period, but have deliberately put a Quality Assurance mechanism into place before bills are sent. While this adds to the Days to Bill, the increase in billing accuracy due to Quality Assurance prior to billing ensures that a higher percentage of bills are paid upon first-time submission. By measuring both Days to Bill and First-time Billing Accuracy, MCHD can make an informed decision about the design of its billing process.

### MCHD Performance Results in Key Functional Areas

Functional Area	Metric	Before RescueNet	After RescueNet	Improvement
Operational – Dispatch/Field	Productivity – staffing avoidance	20 FTE (planned)	16 FTE	25% more efficient – four FTE hiring avoided = \$200K/year savings
	Dispatcher/medic call efficiency	4 to 5 separate calls	1 call	3 to 4 fewer calls per incident
		4 ½ to 5 talk minutes per incident	½ minute	8 to 10X talk time saved per incident
Operational – Billing	Days to bill	2 weeks	5 days	Reduced days to bill by over 50%
	Pre-bill audit (150 - 250 bills/day)	Not feasible	1 hour/day	100% audit
	Revenue collected	—	—	25% increase year to year
Clinical Quality	Productivity of clinical queries – data mining (12 months data)	16 hours (960 minutes)	3 minutes	320x more efficient
	Retrieve statistics on intubation outcomes, by medic (12 mos. data)	Not feasible	2 minutes	Makes analysis possible/prompt

The following three pages examine these three key functional areas and their associated performance results in more detail.

## MCHD Accomplishments Operational – Dispatch/Field

Leveraging mobile and data management technology to eliminate paperwork has resulted in big operational gains for MCHD, including a 25 percent increase in dispatcher productivity and a five-time reduction in the number of calls required between dispatchers and medics.

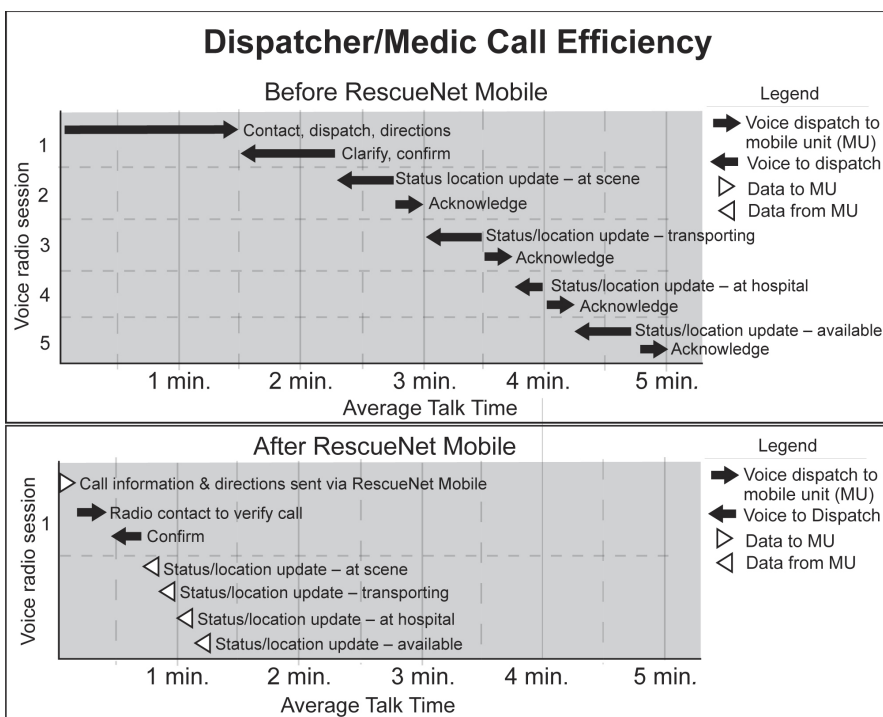
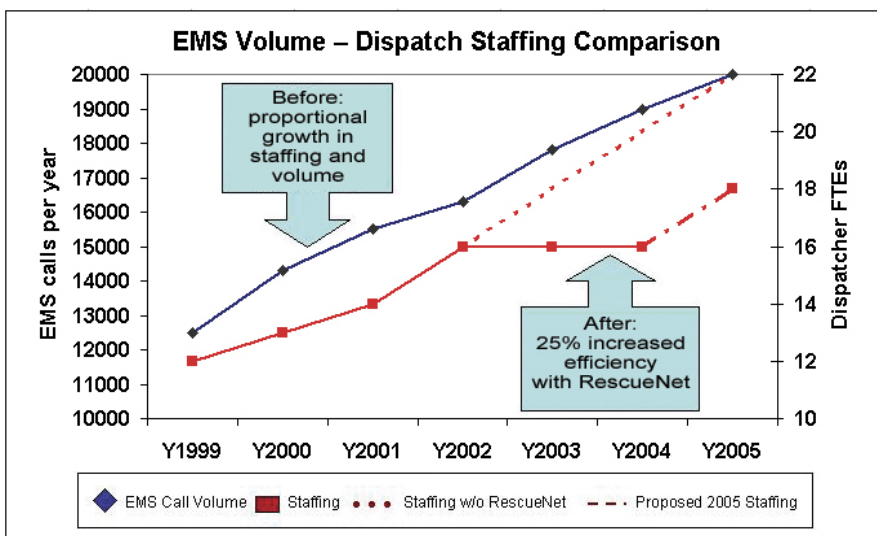
Between 1998 and 2004 their EMS transports grew from 11, 200 to the current 17,800. Additionally the same dispatchers support 14 fire agencies by handling 20,000 additional calls a year. This increasing work load from both EMS and fire placed a large and growing burden on the dispatchers and on the economics of the operation

To blunt the impact of the problem, in 2003 MCHD replaced its old CAD with RescueNet Dispatch (formerly known as RightCAD). MCHD already had RescueNet Billing, which shares information with the same SQL data base as Dispatch, and other RescueNet products, so the decision was an easy one. They also added the RescueNet Mobile (formerly Nomad) product, which provides dispatch information on a mobile unit in the ambulance, and allows two-way data communications.

Allen Johnson tells the story: “Once a call is dispatched the Mobile product takes over. There’s one radio call—from the dispatcher to confirm receipt of the wireless transmission. That’s it. Everything else can be handled as data. The crews are able to update their status as far as on route, arriving at the scene, transporting—all from the cab of the vehicle.

The system automatically monitors for time variance between expected parameters versus actual parameters, that is, once the unit gets a call we have a guideline for how fast they get en route for the call. If the unit exceeds that timeline there is an indicator that alerts the dispatcher that they need to check on the ambulance. Similar monitoring takes place on all steps in the process – time on route to on the scene, scene times and transport times. Depending on the parameter and how far off it is, the software actually requires a reason to be entered, so we can monitor our variance.

We’ve not only increased our dispatcher productivity, we’ve freed up time for our medics, increased the quality of the patient record, and added structure for process improvements.”



## MCHD Accomplishments Operational – Billing

Instant access to electronic data and real-time updates to the database have compressed the billing cycle from more than two weeks to five days. In addition to increasing MCHD’s cash flow, customers receive more timely, accurate, and professional-looking bills.

Karen Webb is the MCHD Billing Supervisor, and she has been instrumental in designing the billing system starting with the selection of RescueNet Billing, and continuing as they add new RescueNet products. “When we brought RescueNet Dispatch online, extending the Billing and Field Data products, we could start watching information from the first point of service. Before the new system it took an average of two weeks from service to getting a bill out the door. Now we can do it in an average of five days. And, having cut the billing cycle by more than half, our next goal is to be able to bill within 48 hours of when sent. We know we can get there.”

Improvements continue in billing metrics. Just in the last 12 months they have increased their revenue collected by 25%, the result of a mindset of continuous process improvement. The single database between the dispatch and the billing system has enabled a whole new set of improvements.

They are also sharing their expertise with other agencies. Six months ago MCHD partnered with another EMS provider that was using only part of the RescueNet suite. Together they revised the work flow process and added seamless data export from RescueNet Field Data for PC into RescueNet Billing. The result far exceeded their expectations – the service’s revenue jumped by 87% by the end of their second quarter using the new process.

<b>Activity Summary</b>			
Trip Date IS BETWEEN 09/01/2003 AND 10/31/2003			
<u>Pavor</u>	<u># of Trips</u>	<u>Gross Charges</u>	<u>Contr</u>
Medicare-LaGrange Township	8	4,834.50	1
<b>Totals for Medicare</b>	<b>8</b>	<b>4,834.50</b>	
<u>Pavor</u>	<u># of Trips</u>	<u>Gross Charges</u>	
Medicaid-LaGrange	1	621.50	
<b>Totals for Medicaid</b>	<b>1</b>	<b>621.50</b>	
<u>Pavor</u>	<u># of Trips</u>	<u>Gross Charges</u>	
ANTHEM SENIOR	3		
CARESOURCE	1		
CIGNA INSURANCE COMPANY	1		
EMERALD HEALTH NETWORK	1		
MEDICAL MUTUAL - BOX 6018	7		
PALMETTO GBA	1		
PRINCIPAL MUTUAL INSURANCE	1		
QUAL CHOICE	1		
THE FUNDS	1		
UHC/SALT LAKE	1		
<b>Totals for Insurance</b>	<b>1</b>		
<u>Pavor</u>	<u># of Trips</u>	<u>Gross Charges</u>	
Bill Patient			
<b>Totals for Bill Patient</b>			
<b>Grand Totals</b>			
RescueNet™ C:\PROGRAM FILES\			

### Billing Lessons Learned

By Karen Webb  
MCHD Billing Supervisor

- It was instrumental that the medics understood that collecting and entering information was vital for every step, from the initial 911 call until the bill was paid.
- Crews simply must close out all calls at the end of the day to get the timeliness and accuracy that is needed.
- Dispatchers and medics must be trained, and continually retrained, on data entry.
- Hiring a compliance officer was key. We could not have achieved our business and quality metrics without her on board, requiring everyone to be accountable for complete and accurate information that is used for a variety of purposes – billing, clinical, legal, and operational.
- Hiring a collection agency for delinquent accounts was essential for us. They provided the follow-up that was needed while we were able to focus on current work.
- We made it so easy with the tools we put in place, such as the new billing software, that we did not always focus on policies and procedures. Policies are critical to success and therefore cannot be ignored.

# MCHD Accomplishments Clinical Quality Improvement

On the clinical side, MCHD’s focus on a paperless operation has allowed them to achieve its goal of continuous quality improvement mandated by the board of directors. Performing clinical queries on twelve months worth of data, which previously would take 16 hours, can now be done in three minutes or less. Retrieving statistics on the outcome, by medic, for intubation procedures had not been feasible; now a report can be produced in two minutes. This, as well as a whole host of previously unavailable information, is now accessible for analysis, trending and education.

“One of our missions is to review and improve the service we deliver, but we can’t improve without data,” said Quality and Resource Director Kelly Curry. “Before RescueNet, it took days to review a single set of procedures and outcomes. Now, we can access reports in a matter of minutes. This makes benchmarking and comparison for continuous improvement part of our routine, without sacrificing efficiency.”

“In a paper-based environment your quality analysis is limited to sampling, because it is so much effort to go through all the paper reports. But with an integrated data management environment we can query 100% of the population data. For example, if you are looking at the intervention protocol for a suspected diagnosis (see sample report below) in a paper environment, you may only be able to sample only 20% of all the reports. By sampling only 20 of every 100 reports you may miss the one very significant patient chart in the 80 reports you did not look at; you may miss the one piece of data that will help you improve the quality of your patient care,” continued Mr. Curry.

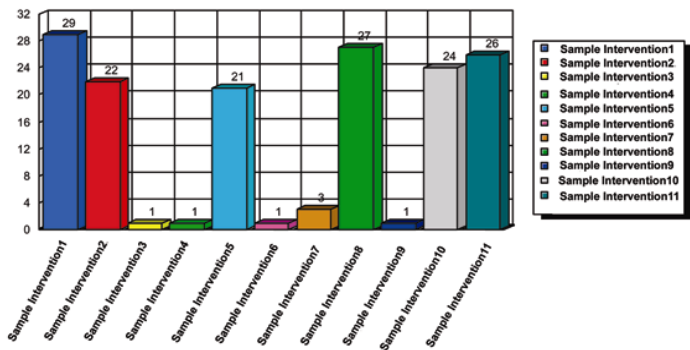
“The medics value the constructive criticism through direct feedback and focused training sessions that include real data about their performance,” said the Quality and Resource Director. “I would personally never consider working for an organization without a comprehensive, well-integrated data management system,” concluded Mr. Curry.

### Performed Interventions Summary by Suspected Diagnosis

#### Montgomery County Hospital District

Sample Diagnosis : 30 patients

Sample Intervention1: administered to 29 patient(s)	96.67%
Sample Intervention2: administered to 22 patient(s)	73.33%
Sample Intervention3: administered to 1 patient(s)	3.33%
Sample Intervention4: administered to 1 patient(s)	3.33%
Sample Intervention5: administered to 21 patient(s)	70.00%
Sample Intervention6: administered to 1 patient(s)	3.33%
Sample Intervention7: administered to 3 patient(s)	10.00%
Sample Intervention8: administered to 27 patient(s)	90.00%
Sample Intervention9: administered to 1 patient(s)	3.33%
Sample Intervention10: administered to 24 patient(s)	80.00%
Sample Intervention11: administered to 26 patient(s)	86.67%



RescueNet™ Reporting

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### Automated reporting

According to Mr. Curry, once MCHD defines the data elements of a report, they schedule that report to run automatically. So every Monday morning the report can be on the printer, and by Monday afternoon they can be holding a training session with their medics.

“Because we now look at 100% of the data, we can train down to the individual medic level. That is huge from a quality perspective,” he concluded.

The data base can be accessed and/or customized for more intricate work using third party software such as Crystal Reports.

### Benefits of RescueNet reporting

- Paperless
- Instant
- Efficient
- Confidential
- 100% of data evaluated
- Over 150 standard reports with RescueNet.
- All data is available in the Patient Care Record

**ZOLL Data Systems**

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