
Validating the efficacy of PerfectServe One-2-One:

**A digest of the University of Colorado study
on hospital-to-physician contact**



PerfectServe
ONE·2·ONE

Summary

In 2004, The University of Colorado Health Sciences Center conducted an independent research project sponsored by PerfectServe, Inc. The study evaluated the impact of the PerfectServe One-2-One patient care communication service on hospital-to-physician contact and communication processes, cycle times, and nurse/physician satisfaction.

Of the four hospitals that took part in the study, one had recently adopted PerfectServe One-2-One as its method of contacting physicians, while the other three were using conventional contact methods.

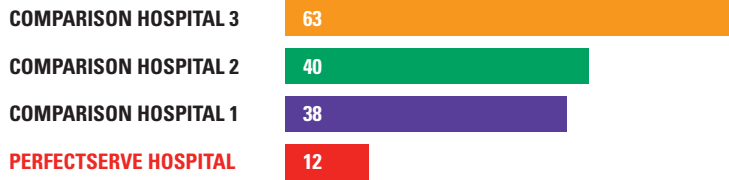
This report presents final results of the study, including analysis of 290 communication attempts observed in seventeen units within the four participating hospitals.

In sum, the study concluded that the PerfectServe hospital showed a significant reduction in hospital-to-physician communication cycle times, as well as a reduction in process decision points and information hand-offs, as compared to the usual care systems at three comparison hospitals. Key findings are presented in the graphs below.

In addition, nurses and physicians who used PerfectServe One-2-One expressed greater satisfaction with the state of hospital-to-physician communications than did the comparison personnel, who were frequently overheard complaining about serious breakdowns in the existing system.

Figure 1

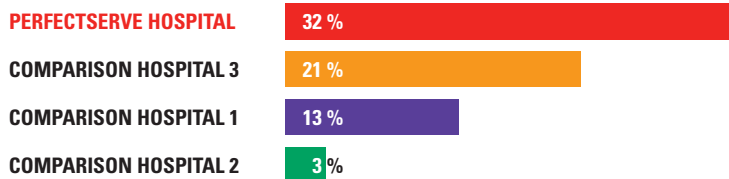
Subsequent calls to contact a physician occurred 81 percent less frequently in the PerfectServe hospital than in the worst-case comparison facility, and 68 percent less frequently than in the best-case comparison facility.



Subsequent calls per 100 physician contacts

Figure 2

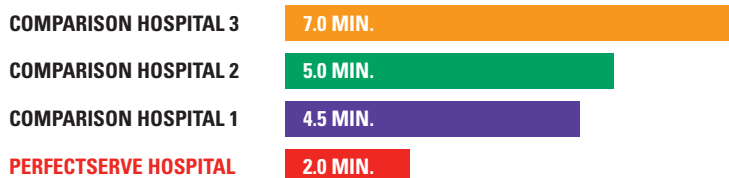
The PerfectServe hospital completed 10 times more contacts within two minutes than did the worst-case control facility.



Physician contact cycles completed in 2 minutes

Figure 3

The PerfectServe ICU achieved a 71 percent reduction in the time required to contact a physician, as compared to the ICU of the worst-case comparison hospital.



Median ICU call cycle-time (minutes)

Study Description

Introduction

The PerfectServe One-2-One Study was an independent research project sponsored by PerfectServe, Inc., and carried out by researchers at the University of Colorado Health Sciences Center.

Study objectives

The purpose of the study was to evaluate the impact of PerfectServe One-2-One on hospital-to-physician contact. Specifically, the study was intended to address these questions:

- *Who in the hospital calls physicians, and how long does it take to complete a contact? How many calls do departments make to physicians, and when do they make them?*
- *What are the reasons physicians are contacted, and how often is a quick response required?*
- *What is the risk that delays or breakdowns in physician contact might lead to patient harm?*
- *How does PerfectServe impact the physician contact process? Does it simplify the process? Does it speed the process?*
- *What is the impact of PerfectServe on physician contact cycle times? Does it reduce delays and breakdowns in physician contact? Does it help improve nurse productivity, facility utilization and patient throughput?*
- *How do hospital nurses and clinical staff regard PerfectServe? Do they find it easy to use?*

Participating hospitals

The PerfectServe One-2-One Study compared data collected at four hospitals over a fifteen-week period.

The hospital using PerfectServe was Fairfield Medical Center, a 222-bed general medical and surgical hospital located in Lancaster, Ohio, about 20 miles southeast of Columbus. During January of 2004, Fairfield Medical Center deployed PerfectServe One-2-One throughout all of its 27 medical departments and 191 active staff physicians.

The three comparison hospitals included:

- C1, a 165-bed hospital that was selected because of its similarity to the hospital using PerfectServe. Both hospitals are general medical and surgical facilities located in secondary, single-hospital cities in Southern Ohio.
- C2, a 440-bed hospital located in a large, competitive urban market in Ohio.
- C3, a 477-bed hospital located in a competitive urban market in Tennessee. Both C2 and C3 were selected because of their dissimilarity to the hospital using PerfectServe, and their similarity to one another.

The Problem

Breakdowns in hospital-to-physician contact

Nurses and other hospital staff need to contact physicians every minute of every day. In fact, during the period of this study, the hospital using PerfectServe averaged more than 11,000 physician contacts per month.

Breakdowns in physician contact processes can cause serious problems in hospitals. Breakdowns can also delay clinical decision-making processes, thereby increasing patient-care risks. They can reduce staff productivity and slow patient flow, wasting scarce and expensive human and facility resources. They also tend to exacerbate nurse and physician frustration.

There are four primary reasons why physician contact breakdowns occur:

1 Large numbers of process decision points

Every decision point is a potential source of error:

- Third-party physician directories, hospital directories, and handwritten lists taped to walls – with sporadic updates
- Open-text call handling instructions – often complex, contradictory or incomplete
- On-call schedules which are sometimes difficult to interpret and often outdated
- Last minute “sticky note” instructions highlighting exceptions
- Human memory

Often nurses and unit staff are the decision makers, but they also may rely on external players (e.g. commercial answering services), using similar tools and methods, to route their calls.

2 Numerous communication hand-offs

A single physician contact attempt may pass from nurse to unit secretary to answering service to physician, with the response passing through the same number of hand-offs in reverse. Each hand-off represents a potential source of error.

3 Growing numbers and varieties of players

Long-tenured nurses are retiring, taking their extensive memory of physician habits and contact preferences with them. Hospitalists increase the need to proactively communicate with outside members of patient care teams. Contract nurses don't have the experience to know "the rules" on how to reach individual physicians.

4 An increasing variety of communication devices and technologies

More doctors are adopting mobile phones, voicemail, email, and text messaging – with many abandoning their pagers. More nurses are carrying wireless phones, calling from bedsides rather than central stations. With every new contact device introduced, process complexity increases.

Hospitals tolerate delays and breakdowns because process failure has become routine. Attempts to fix problems have proven ineffective, costly, and difficult to implement among physicians with well-established preferences. Few are aware of any effective alternative to the status quo.

"A patient with a cardiac history came into the hospital for hemorrhoid surgery. In the afternoon following surgery, his nurse noted that he was talkative and doing well. Later that evening she discovered him short of breath and 'sating' 54% which at first she couldn't believe (normal levels are 90-100%) but she rechecked it and the value was correct. She put him on oxygen and paged the surgery resident. When the surgery resident called back 30 minutes later, he instructed the nurse to call cardiology. When the nurse went in to check on the patient shortly thereafter, he was experiencing severe chest pain. She treated the patient with his usual medication that included 'nitroglycerin pills' and his heartburn medication. When he still did not feel better, she re-paged the surgical resident with no response (+30 minutes). She then paged the patient's cardiologist and he called back (+20 minutes) saying that his symptoms sounded 'like his usual pattern' and he would come up to see him after he got out of his meeting. When he came to the floor (+31 minutes) the patient was in extreme distress, intubated and transferred to the ICU. Sometimes, how long it takes to communicate with the patient's physician can have drastic consequences for patients."

– Nurse report from comparison hospital

"I hate the system we have because we constantly have to chase doctors down. We call their office and are told they are in the hospital. We call different floors trying to catch them while they are on rounds or have the hospital operator page them overhead and still can't find them."

– Nurse from comparison hospital

The Solution

The PerfectServe solution

PerfectServe One-2-One For Hospitals is a physician contact tool that provides hospitals with an accurate, reliable and precise means to reach any physician, or the appropriate covering physician, at any time.

PerfectServe works by creating and maintaining a digital protocol of every physician's contact preferences for every moment of every day. These rules are consolidated into a single community directory accessed through speed dial on the hospital PBX.

When a caller attempts to contact a physician, PerfectServe engages that doctor's protocol and routes the call down the appropriate call path defined by the physician for that moment in time.

Thus, conventional answering services and hospital switchboards are bypassed, so errors attributable to human-centric routing are eliminated.

Call outcomes

PerfectServe finds doctors and contacts them via whatever communication device or method the physician has chosen to use at any point in time. When a physician is reached through PerfectServe, one of three call outcomes can take place. Each of these three call outcomes is diagrammed in **Figure 7** on p. 8.

1 Real-time contact

Physicians can route calls directly to one of six predefined telephone locations, e.g., cell phone, home, office back-line, etc., using PerfectServe's FollowMe capability. This results in the quickest, most direct contact method and has enabled many physicians to eliminate a pager and enjoy the convenience of carrying a single wireless device.

2 Voice message with failsafe notification

Physicians can elect to ask callers to leave detailed messages in their PerfectServe inbox with either immediate or future notification. Messages not retrieved within a pre-defined time period follow an automatic escalation protocol defined by each physician. This failsafe notification process may repeat to the same device, or to alternative devices, or it may escalate to a backup physician on-call. Thus, messages are never lost, and the need for nurses to make additional contact attempts is eliminated.

3 Direct page

PerfectServe fully accommodates physicians who choose to use paging, SMS or text messaging as their sole contact method. Because PerfectServe knows the origin of each call, it automatically transmits the correct callback number. However, because it is impossible for PerfectServe to know if a doctor has received a message via pager, nurses must remember to repeat their contact attempt if a doctor does not respond in a timely manner.

Individual physician control

Physicians can stipulate how they wish to be reached at every moment of the day, and they can specify different contact and notification methods for calls with different attributes.

For example, a doctor might route routine consults to voice messaging with notification in the future at a defined time each day, while routing STAT consults directly to a mobile phone in real time.

PerfectServe provides hospitals with a single standardized process for reaching every doctor on staff, while fully accommodating the complex variables, protocols, and mobile realities of how physicians practice medicine today.

Study Methods

Observation

Physician contact activity at each of the subject hospitals was observed in order to document the conventional processes and tools used at C1, C2 and C3 (the Usual Care Method), and to compare these to the contact method in place at the hospital using PerfectServe.

Particular attention was paid to the steps required from the time a hospital staff member decided to contact a physician, until the communication cycle was completed.

The observer also recorded relevant comments – solicited as well as spontaneous – from physicians and nurses at all four hospitals.

Observers recorded:

- Hospital department, date and time.
- The Start Actor (the individual who initiated each call), the Caller (the individual who dialed each call) and the Return Caller (the person who returned each call, when applicable.)

- The Decision Points, or the points at which a Caller was required to look up data and/or make judgments in order to process a call.
- The Hand-offs, or the points at which information critical to effective communication was passed from one party to another.
- The Cycle Time, or the amount of time required to complete a communication cycle, beginning with the time of the initial call and extending until contact was achieved.
- The number of calls required to complete a given communication cycle.
- The reason for the call and the action that resulted from it, if any.

The PerfectServe hospital provided the University of Colorado research team with monthly activity summary reports for June and July, 2004. This data, represented in **Figure 5** below, provides a monthly call volume baseline. Because collecting comparable data from the comparison hospitals presented practical impossibility, the data from the hospital using PerfectServe is presented for context only.

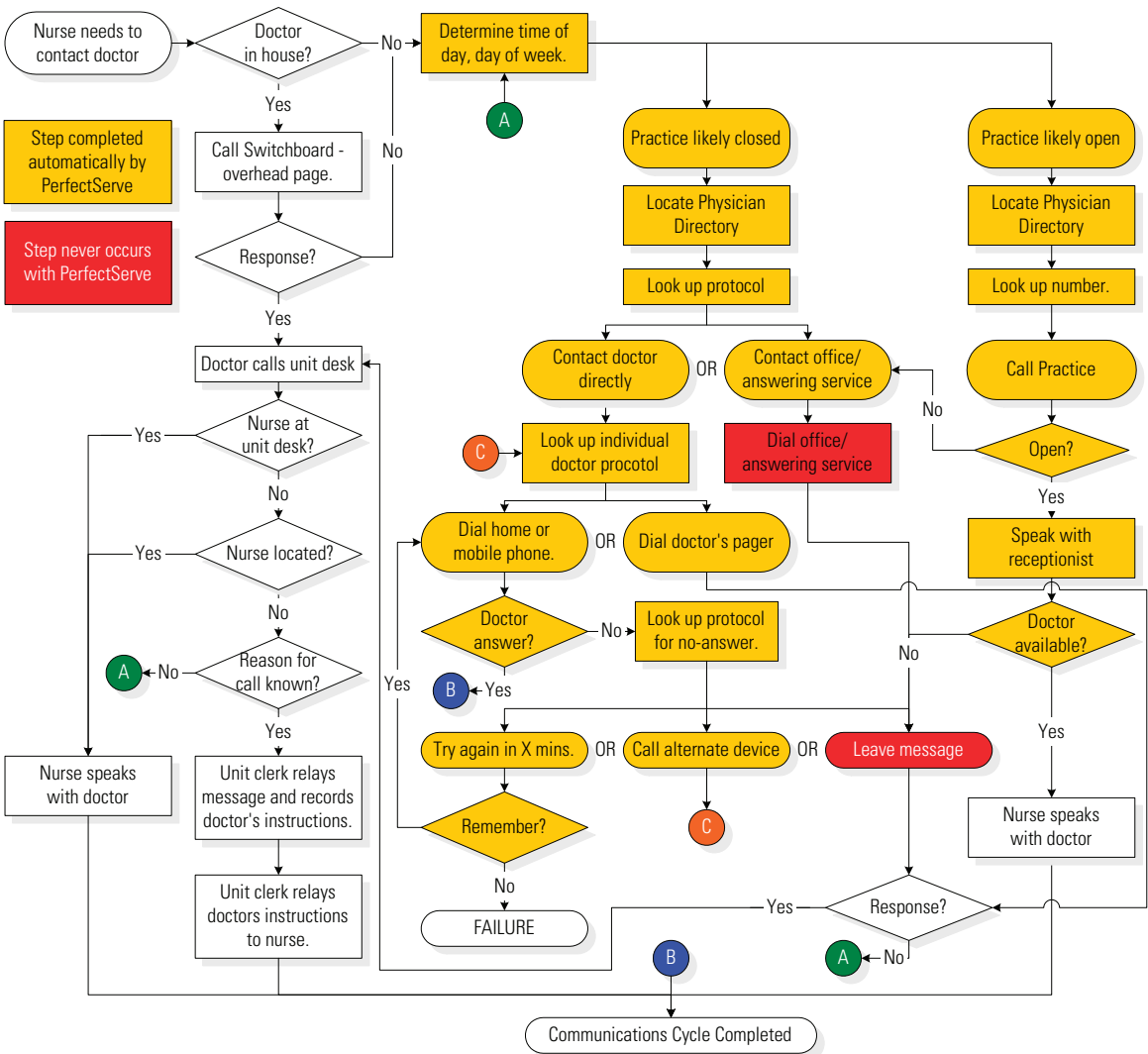
Department	PerfectServe Hospital	C1	C2	C3
Medical/Surgical	+	+		+
Telemetry	+	+		
Emergency	+	+		+
Maternity	+	+		
ICU	+	+	+	+
Oncology			+	
Same Day Surgery			+	+

The study included direct observation of 290 unique communication cycles originating from 17 unique hospital/departments:

Day/Time Interval	June 2004		July 2004	
	Count	%	Count	%
Mon-Fri – 8-5	5,645	51.1%	5,572	50.4%
Mon-Fri – After hours	3,421	30.9%	3,412	30.9%
Sat and Sun	1,965	17.8%	2,072	18.7%
Total Calls	11,031	100.0%	11,056	100.0%

Study Findings

Figure 6: Usual care nurse-to-physician contact process: Telemetry Department Comparison Hospital 1



Process comparison

At C1, C2 and C3, there were an infinite variety of possible methods for contacting a physician. **Figure 6** outlines the physician contact process in the Telemetry department at C1.

The Usual Care Process at C1 is representative of the variety of possible methods for contacting physicians at C2 and C3.

At the hospital using PerfectServe, callers followed one of three pre-defined processes for all physician contact attempts regardless of time of day, day of week, or location in hospital. It is evident that the PerfectServe process at this hospital requires fewer hand-offs and requires the caller to make fewer decisions to complete a communication cycle.

(Figure 7)

Figure 7: PerfectServe One-2-One nurse-to-physician contact process: Fairfield Medical Center (all departments)

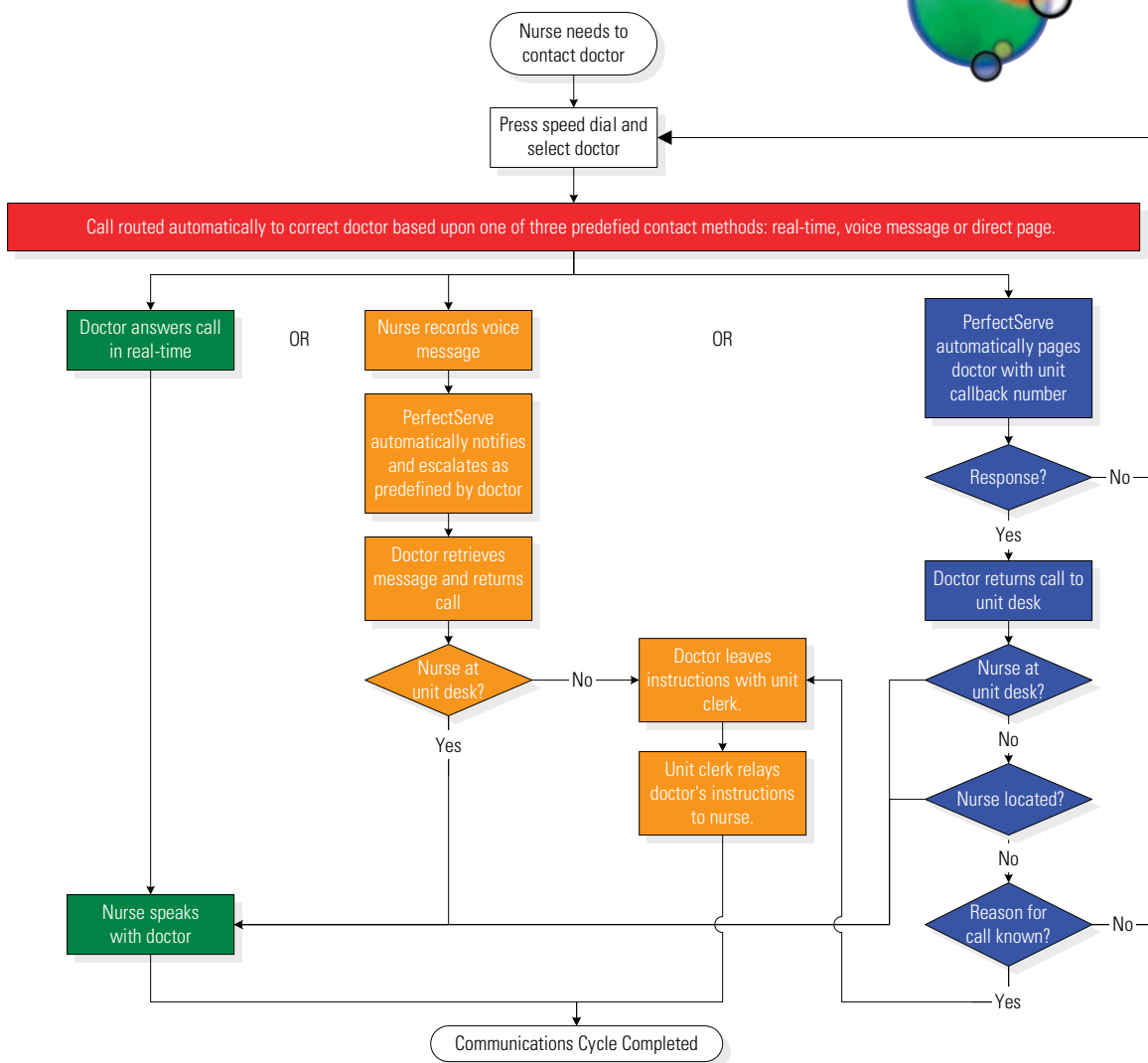
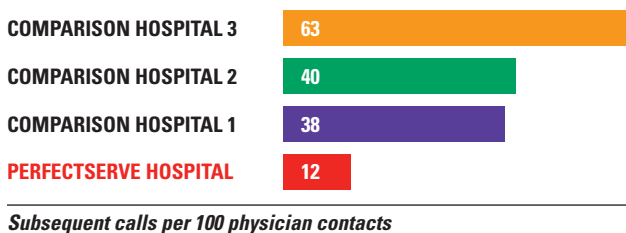


Figure 8 shows that subsequent calls to contact a physician occurred eighty-one percent less frequently in the PerfectServe hospital than in the worst-case control facility, and sixty-eight percent less frequently than in the best-case control facility. Thus for every 100 communication cycles, callers at C3 had to make 163 calls compared to 112 calls at the hospital using PerfectServe – demonstrating the positive impact of fewer decision points and hand-offs in the contact process.

Figure 8: Subsequent calls to contact a physician



Study Findings

Figure 9: Median ICU cycle time by hospital

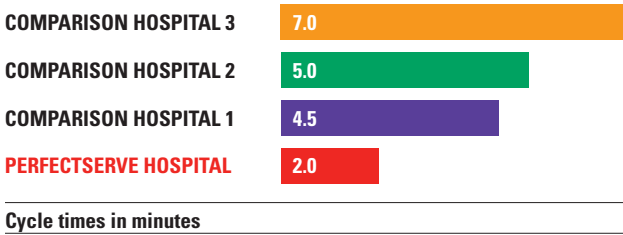


Figure 9 indicates that the median cycle time at the Intensive Care Unit at the hospital using PerfectServe is significantly less than at C1, C2 or C3. The ICU was the only department for which comparative data was available for all four hospitals.

Figure 10: Overall median cycle time by hospital

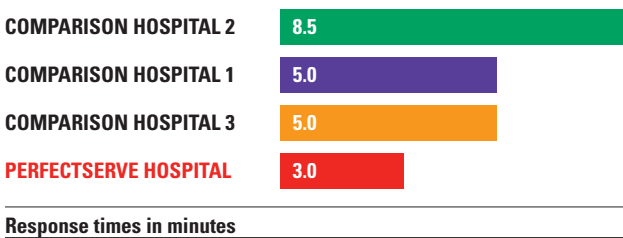


Figure 10 indicates that the median cycle time of all calls observed is significantly less at the hospital using PerfectServe than at C1, C2 or C3.

Figure 11: 2-minute cycle time events

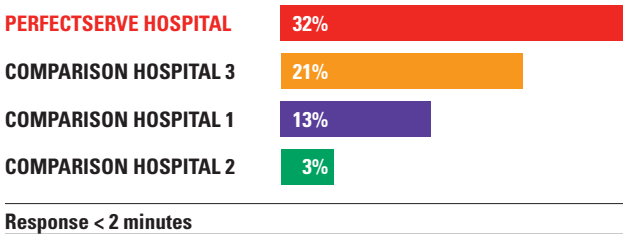
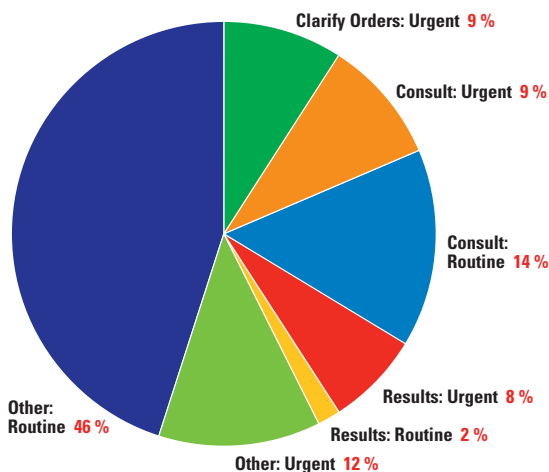


Figure 11 shows that the PerfectServe process led to a significantly higher proportion of communication cycle times completed in two minutes or less.

Figure 12: Data collection effort after the formal evaluation of the PerfectServe system



PerfectServe hospital call data

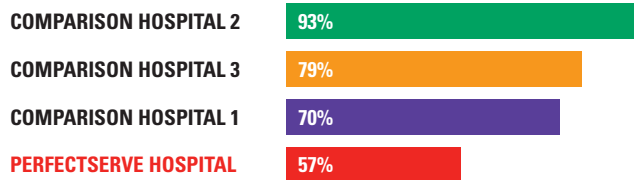
After the formal evaluation of the System was complete, the hospital using PerfectServe decided to prompt callers to select from among eight reasons for their call each time they used the system to contact a physician. This data collection effort was conducted over a fourteen-day period in June 2004. Results of this project are presented in **Figure 12**.

Start actor

Figure 13 shows the number of calls initiated by nurses, compared to the number of calls initiated by physicians, in each of the hospitals studied. Note that in every instance, nurses were responsible for well over half of the physician contacts.

Figure 13: Start actor by hospital

NURSES / percent of events



PHYSICIANS / percent of events



OTHER / percent of events

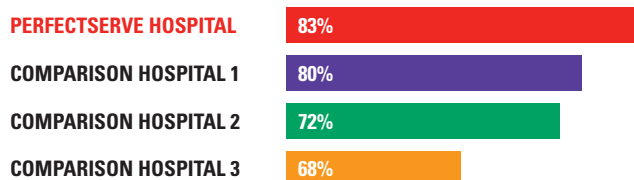


Call acuity

Figure 14 indicates that call acuity was most often Essential across all hospitals. Call acuity was based on the Reason for Call. Thus, a change in the patient's status needing immediate response from the physician was judged to be of higher acuity than the nurse calling to inform the physician about a normal laboratory value.

Figure 14: Call activity

ESSENTIAL / percent of events



IMPORTANT / percent of events



ROUTINE / percent of events



Discussion

Fewer steps mean fewer errors

PerfectServe is able to decrease the number of steps in the physician contact process and greatly improve the overall speed of hospital-to-physician communication.

In tracking call cycles, the complexity of the existing process became evident. **Figure 6** attempts to diagram the process flow in the usual care model and compares with **Figure 7**, which outlines the call processes at the hospital using PerfectServe. Each decision point in the usual care model slows the process and creates an opportunity for error, as does each hand-off.

Because PerfectServe requires fewer decision points and hand-offs to complete a physician contact cycle, it is reasonable to assume it will also reduce the probability of communication breakdowns and delays. Since more than three-quarters of the calls observed were essential and required a timely response, it is reasonable to conclude that PerfectServe likely improves care and reduces preventable patient harms.

Quicker cycle times

The median, two-minute, and five-minute cycle times were all much better at the hospital using PerfectServe than in the three comparison hospitals.

The median cycle time per call for the hospital using PerfectServe was a full two minutes less than at C1 and C3, and nearly six minutes less than at C2.

This result has implications not only for patient safety but also for staff productivity. In a hospital where nurses complete 11,000 contact events each month (**Figure 5**), four minutes wasted per cycle amounts to 8,800 direct physician care hours per year – or the equivalent of more than 4 full-time nurses.

In a larger hospital, with higher communication volumes and slower cycle times, the increased productivity could be many times greater.

“I have to wait on hold for two or three minutes each time I call the answering service and then have to remember to call back if the doctor doesn’t call me.”

– Comparison hospital nurse

“I like the PerfectServe FollowMe mode since I call the doctor and he answers and I can talk to him right away!”

– PerfectServe hospital nurse

Fewer repeat calls

In the usual care approach, the caller must remember to try again when a physician does not respond to the first – or a subsequent – contact attempt. In addition, callers frequently leave messages with practice staff or answering service operators.

By contrast, PerfectServe automatically escalates notification when a message is not retrieved within a defined period of time, relieving hospital staff of the burden of tracking and remembering to manually escalate. In addition, PerfectServe voice messages bypass transcription, again reducing the chance for errors.

Fewer hand-offs

In the usual care approach, it is rare that the caller directly connects with the physician on the first attempt. One common cycle observed at the comparison hospitals consisted of the nurse giving information to the unit clerk who then talked with the physician’s office staff, who then talked with the physician who then told the office staff to call in an order, the office staff told the unit clerk who had to track down the nurse to write the order in the chart. Each hand-off represents the potential for a medical error. PerfectServe’s ability to directly connect hospital callers with physicians reduces information hand-offs between care providers.

Improved patient flow

Observation revealed that communication delays can slow patient flow and tie up facility resources.

A patient came in for surgery on the left breast but the consent form incorrectly stated the surgery was on the right breast. The nurse paged the surgeon three times and left messages at his office but he didn't call back for 30 minutes and the case did not start for 20 minutes after the scheduled time. All of the following cases were delayed.

– Observed at comparison hospital

Thus, if a surgical case is delayed because a nurse cannot contact the physician about a vital issue prior to beginning a case, the cases that follow are also delayed.

"A nurse needed to talk with a physician to get orders to transfer a patient to another floor. She first paged the physician at 10:00 AM, called his office at 10:20, re-paged at 10:35, again called the office at 1:30 PM and was told the Doctor was in surgery and would call back. When he didn't call back she called again at 5:00 PM and the office paged him. Finally, the next morning she called the referring physician and obtained transfer orders."

– Comparison hospital nurse

Such delays can lead to unnecessary and unreimbursed costs, lost revenues, and loss of goodwill from patients and their families.

Automatic data collection

PerfectServe is able to collect a tremendous amount of information in the course of processing calls. This information provides the medical staff and the hospital administration with a powerful measurement tool for use in continuous process improvement.

Larger facility, greater complexity

It was observed that, as a hospital increases in size, communications complexity increases.

At the PerfectServe hospital, there were about 190 staff physicians and 406 nurses, whereas at both C2 and C3 there were more than 1,000 physicians on staff and more than 1,000 nurses. Where there was one ICU at C1, with a ward clerk who had been there for 15 years and knew all of the physicians, at C2 there were two ICUs with two ward clerks on each shift, and it was impossible for the ward clerks to know all of the physicians.

While C1 maintains a "hospital staff directory" and "on-call lists", these were often outdated or could not keep up with recent changes. Yet at the larger C2, units were forced to consult Yellow Pages and outdated county medical society physician directories to locate numbers for less frequently contacted physicians.

These factors increased the complexity and the risk of failing to find the correct physician on call for each group. Callers were forced to make more subsequent calls (**Figure 8**). In addition, C2 nurses were obliged to decide whether to contact the resident or the attending physician – introducing yet another level of complexity – since these rules varied from physician to physician.

Conclusions

1 PerfectServe introduces a superior physician contact process

PerfectServe requires hospital callers to make fewer decisions and fewer patient information hand-offs in the course of contacting physicians.

2 PerfectServe reduces communication cycle times

The hospital that used PerfectServe evidenced significantly quicker contact cycle times and significantly more calls returned in under two minutes than the usual care approach employed by the three comparison hospitals observed in this study.

3 PerfectServe increases staff productivity and resource efficiency

Because of the reduced cycle times, nursing staff time and hospital facilities were utilized more efficiently at the PerfectServe hospital.

4 PerfectServe results in greater physician and nurse satisfaction

Hospital staff and physicians at the PerfectServe hospital spontaneously expressed greater satisfaction with the PerfectServe System over their former physician contact system.

5 PerfectServe is likely to improve patient safety

Since the acuity level of the majority of calls observed in this study required an immediate response to assist in directing patient care, PerfectServe may help to decrease the risk of adverse consequences due to delayed care, enhancing patient safety and reducing the potential liability for both hospital and physician.

The Research Team

The University of Colorado Health Sciences Center, Department of Family Medicine, which was responsible for the PerfectServe study, is nationally and internationally respected for its education, research, patient care and community service programs. The following research team conducted the study and issued the report:

John M. Westfall, MD, M.P.H., Associate Dean for Rural Medicine. Dr. Westfall has been a faculty member of the University of Colorado Department of Family Medicine for eight years. He is a practicing family physician who devotes approximately 40 percent of his time to direct patient care in a rural community 100 miles from Denver. Dr. Westfall has worked with PerfectServe research team associate Dr. Hildebrandt in a series of studies on the triage of after-hours telephone calls to primary care physicians.

David E. Hildebrandt, Ph.D., Assistant Professor in the Department of Family Medicine. Dr. Hildebrandt is a clinical psychologist currently teaching Family Medicine Residents and carrying out research at the University of Colorado. His research interests have primarily focused on communications between patients and physicians in the ambulatory care arena.

Douglas H. Fernald, M.A., Instructor in the Department of Family Medicine. He has been the project manager and data analyst for several large, multi-year, multi-site research and evaluation projects involving advanced data management and analysis skills. For the past three years he has been the project manager and data analyst for a multi-site, primary care patient safety study.

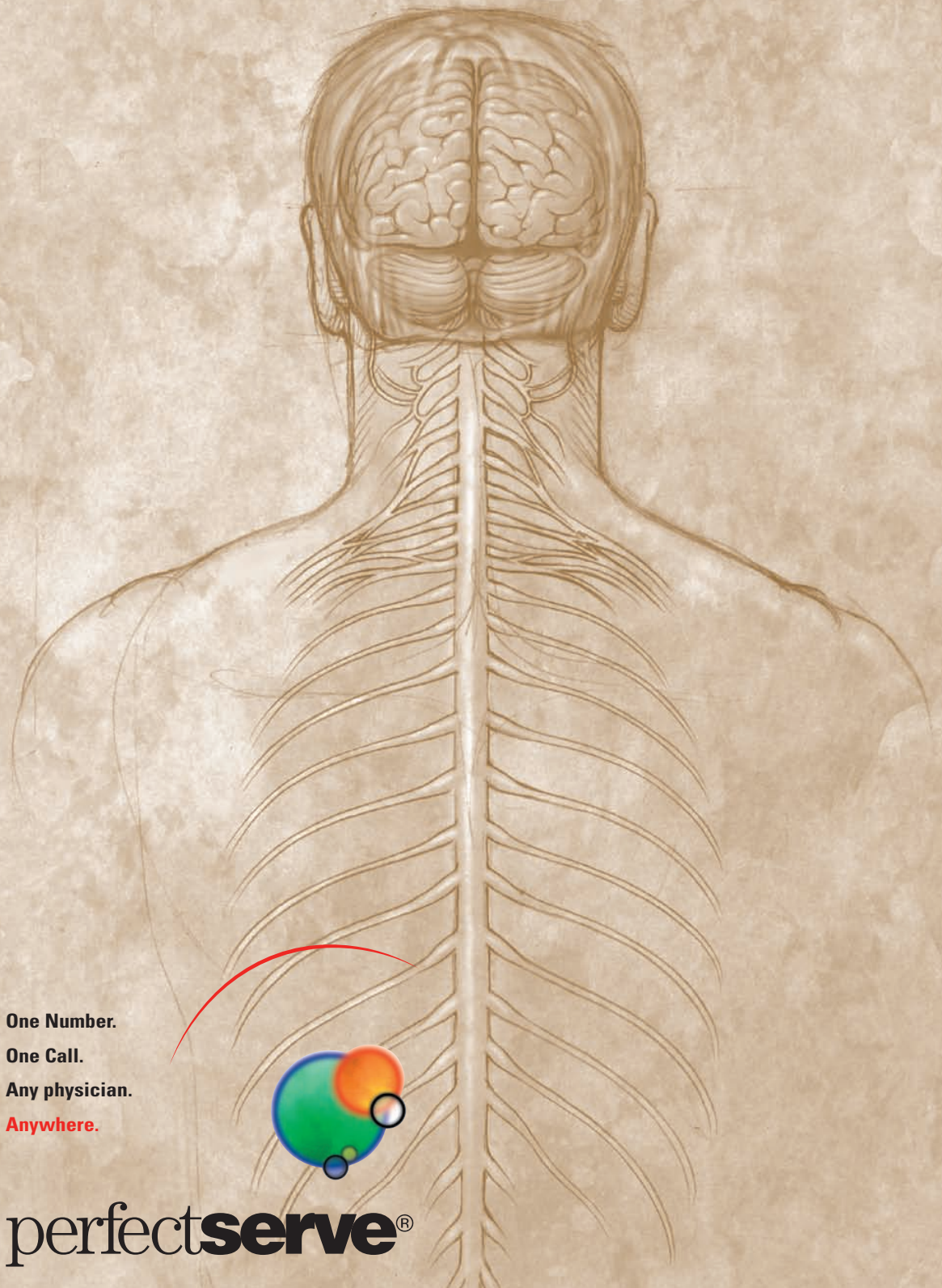
Drs. Westfall and Hildebrandt are Co-principal Investigators on this project, which has been approved by the University of Colorado IRB Committee.

The Company

PerfectServe, Inc. provides patient care communication services to hospitals, physician practices and other healthcare clients across the U.S.

The company employs open-standards based systems and technologies to provide innovative contact management solutions. PerfectServe applications utilize an advanced rules engine to process calls and messages based upon digital protocols customized to the individual needs of hospital departments, healthcare practices and physicians. Process flow algorithms ensure that each protocol is both complete and unambiguous. The result is a system capable of processing millions of voice and data interactions per day – without error.

PerfectServe applications are hosted out of a highly secure data center in Knoxville, Tennessee. The company has engineered its technology platform to eliminate all single points of failure, ensuring that service is always available. HIPAA compliance is provided and maintained through a robust set of access controls and activity logging, while redundant firewalls, intrusion detection and anti-virus applications protect sensitive client information from the outside world.



One Number.
One Call.
Any physician.
Anywhere.

perfect**serve**®

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