# The Distribution of 911 Triaged Call Incident Types within the Emergency Communication Nurse System™

*Greg Scott, MBA[1]; Jennie McQueen, RN[2]; Conrad Fivaz, MD[2]; Isabel Gardett, PhD[1]; Mat Zavadsky, MS[3]; Neal Richmond, MD[4]; Jeff Clawson, MD[1]; Chris Olola, PhD[1]*

1. International Academies of Emergency Dispatch, Salt Lake City, Utah, USA
2. Priority Solutions Inc., Salt Lake City, Utah, USA
3. MedStar EMS-Mobile Health, Ft. Worth, Texas, USA.
4. Louisville Metro EMS, Louisville, Kentucky, USA.

**Correspondence:**
Jennie McQueen, RN, BSN
International Academies of Emergency
 Dispatch
110 S. Regent Street
Salt Lake City, Utah 84111 USA
Phone: +1-801-363-9127 Ext. 213
jennie.mcqueen@prioritysolutionsinc.com

**Keywords:**
Emergency Communication Nurse System; Emergency Nurse Advice; Call Incident Types; Low Acuity Calls; Medical Priority Dispatch System Protocols; 911 Triage; Nurse Triage

## ABSTRACT

**Introduction:** This study examined the distribution of the MPDS® Chief Complaint protocols and determinant codes assigned by the EMD as eligible for nurse triage, as well as the distribution of the Chief Complaint protocols contained in the Emergency Communications Nurse System™ (ECNS™) secondary nurse triage process, as determined by the emergency communications nurse (ECN). Protocol distribution was also examined by patient gender.

**Objective:** This study characterized protocol and gender distributions to provide a better understanding of the types of patients and their associated chief complaints that benefit most from a nurse triage service in the 911 center.

**Methods:** This study examined retrospective case data from two separate metropolitan 911 centers in the United States. The study data was a convenience sample, collected from the inception of the ECN program in each center until the start of the study. The primary outcome measures were the frequency of specific MPDS (Chief Complaint) protocols determined by the EMD for transfer to the ECN, and the frequency of specific ECNS protocols determined by the ECN during caller interaction. A secondary outcome is the gender distribution of patients for cases in the MPDS and in the ECNS.

**Results:** Of the MPDS protocols sent (by the EMD) to be triaged through the ECNS, the Sick Person and Falls protocols had notably high frequencies. Falls, Abdominal Pain, Back Pain, and Vomiting were overall the most frequently used protocols in the ECNS itself. Female patients were users of the ECNS in significantly greater numbers than males, particularly within the Abdominal Pain and Vomiting chief complaints.

**Conclusion:** 911 triage of patients in two urban centers yielded a variety of low acuity complaints that were handled by the ECN. In the MPDS, the five most frequently used protocols made up the vast majority (approximately 87%) of the cases transferred to the ECN, by the EMD. In the ECNS, the six most frequently used protocols made up a substantial portion (approximately 40%) of the cases triaged with those low acuity complaints.

## INTRODUCTION

In 911 centers using the Medical Priority Dispatch System™ (MPDS®), emergency medical dispatchers (EMDs) gather standardized patient information using a structured calltaking protocol designed to assign specific patient determinant codes that designate the severity of illness or injury, along with a general patient description (such as diabetic problems, alert and behaving normally). Patients with certain low acuity conditions, when correctly identified by the EMD, may not require an ambulance response.[1-4] Since most ambulance responses result in subsequent patient transport to a hospital emergency department, dispatching an ambulance on these low-acuity patients can lead to depletion of scarce and costly emergency medical resources both for the ambulance response system and the receiving hospital emergency departments.[3,5,6]

As a potential solution to this mismatching of emergency medical services (EMS) resources, some 911 agencies in the U.S. are placing Emergency Communication Nurses (ECNs)—registered nurses with specialized training in advanced

telephone triage— in the 911 center as clinical experts to handle cases once the initial 911 patient triage is completed by an emergency medical dispatcher (EMD) and the patient is determined to be a candidate for non-ambulance care and further assessment by the ECN. Qualifying patients can be offered alternative transportation and/or treatment facility options, potentially negating an ambulance journey, a visit to the emergency department, or both.

Only certain low-acuity cases may qualify for transfer to an ECN. To determine the cases for transfer, the EMD completes initial triage using ProQA® (the software version of MPDS) and assigns an MPDS determinant code. For this study, certain MPDS determinant codes (OMEGA and ALPHA level) were pre-approved by the International Academies of Emergency Dispatch for transfer to the ECNS ("IAED ECNS-eligible codes"), then selected for inclusion or exclusion by the local medical control authority. At the moment a determinant code is assigned by the EMD using ProQA, the program automatically identifies whether the code is ECNS-eligible. For any eligible code, the EMD receives a computer-generated message advising a transfer of the caller to an ECN. The ECN receives the call by accepting an immediate telephone transfer from the EMD at a specified workstation, along with an electronic case record containing a display of the initial patient information gathered by the EMD. Once the transfer is complete, the ECN begins secondary triage with a series of symptom-based questions for the caller or patient using the PSiam™/LowCode™ nurse triage software, until a patient disposition and point of care (recommended patient destination) are reached. If an ECN is not available for an immediate telephone transfer of the caller for any reason, the EMD immediately places the case in the ambulance dispatch queue, an ambulance is subsequently dispatched according to the agency's standard response priority scheme for that specific low-acuity case, and no further action is taken for that case by the ECN.

This study examined the distribution of the MPDS Chief Complaint (CC) protocols and determinant codes assigned by the EMD as eligible for nurse triage, as well as the distribution of the ECNS secondary nurse triage protocols as determined by the ECN. ECNS protocol distribution was also examined by gender.

## OBJECTIVES

The objective of this study was to provide a better understanding of the type of patients (and chief complaints of those patients) that may benefit most from a nurse triage service in the 911 center.

## METHODS

### Design and setting

This study examined retrospective case data from two separate metropolitan 911 centers in the United States:

Louisville Metro EMS (LMEMS), Louisville, Kentucky (KY), and MedStar, Fort Worth, Texas (TX). From these two centers, data were collected using the two software systems used – ProQA™, which contained the content of the MPDS for the initial 911 triage completed by the EMDs – and PSiam, which contained the content of the ECNS used by the ECNs for the secondary nurse triage. The initial EMD 911 triage of the case yielded a mix of the two MPDS low-acuity priority levels (ALPHA and OMEGA).

### Study population

The study data was a convenience sample, collected from the inception of the ECN program in each center until the start of the study. For the LMEMS center, data collection began on April 10, 2010 and ended on December 31, 2013. For the MedStar center, data collection began on May 20, 2012 and ended December 31, 2013.

### Outcome measures

The primary outcome measures were the frequency of specific MPDS CC protocols determined by the EMD for transfer to the ECN, and the frequency of specific ECNS CC protocols determined by the ECN during caller interaction. A secondary outcome is the gender mix of patients for cases in the MPDS and in the ECNS.

### Data analysis

STATA for Windows® software (STATA Statistical Software: Release 13.0 ©2013, StataCorp, College Station, TX, USA) was used for data analysis. Descriptive statistics such as frequencies and percentages were used in the tabulation of the primary outcome measures: incidents of calls for the top 20 most frequently used CC or primary protocol, priority level, and determinant code; overall and by agency. Analysis was also performed for the distribution of top 20 most frequently used ECNS primary protocols, categorizing by gender.

## RESULTS

A total of 6,727 calls were included in the study (Table 1). Of these calls, a majority (70.5%; n=4,742) were ALPHA priority-level calls and the rest were OMEGA priority-level calls. Specifically, of the 6,028 calls in LMEMS, 70.9% (n=4,273) of the cases were ALPHA-level calls, while in MedStar, of the 911 cases (n=699), 67.1% (n=469) were ALPHA-level calls.

| Priority level | LMEMS (n=6,028) | MedStar (n=699) | Total (n=6,727) |
|---|---|---|---|
| ALPHA | 4,273 (70.9) | 469 (67.1) | 4,742 (70.5) |
| OMEGA | 1,755 (29.1) | 230 (32.9) | 1,985 (29.5) |

**Table 1.** Distribution of all low-acuity calls categorized by MPDS priority level
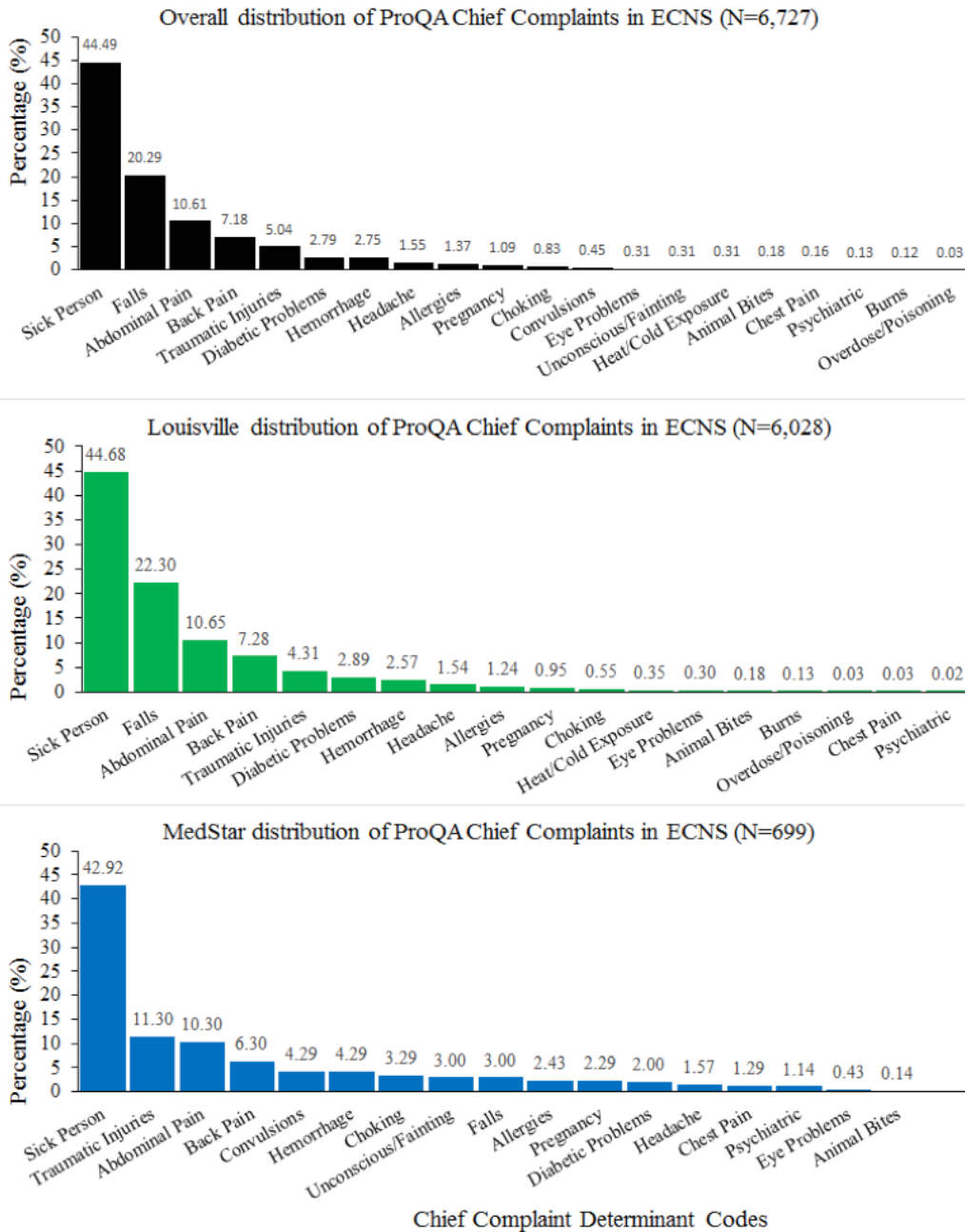
**Figure 1.** Distribution of EMD-determined MPDS chief complaints Protocols

Among the EMD-determined (MPDS) CCs sent for secondary ECNS triage, Protocol 26 (Sick Person) was the most frequently used in both centers and overall (Figure 1). And overall, Protocol 17 (Falls) was the second most frequently used protocol, although the second-most common was different in the two centers (Falls in LMEMS, and Traumatic Injuries at MedStar). Abdominal Pain (Protocol 1) and Back Pain (Protocol 5) were (respectively) the third and fourth most frequently used protocols in both centers. In LMEMS, the top three (most frequent) protocols constituted 78.0% of all cases, and in MedStar, the top three CCs made up nearly 65.0% of all cases.

Among specific EMD-assigned MPDS determinant codes (which include the CC, priority level, and deter-

minant descriptor), overall the most frequently assigned determinant code was 17-A-1 (Fall with injury to a not dangerous, proximal body area) (11.7%) (Figure 2). In LMEMS the 17-A-1 code was also the most frequently assigned, but at MedStar the determinant code 26-A-8 (Sick Person with other pain) was the most frequent. The determinant code 1-A-1 (Abdominal Pain with no high-risk symptoms) was the second most frequently assigned code in both centers (10.3% at LMEMS, and 9.6% at MedStar). The determinant code 26-O-1 (Sick Person with no priority symptoms from a 1st or 2nd party caller) was the third most frequently assigned code in LMEMS center, and in MedStar the third most common was determinant code 26-A-10 (Sick Person, Unwell/Ill). The determinant code 5-A-1 (Back Pain with
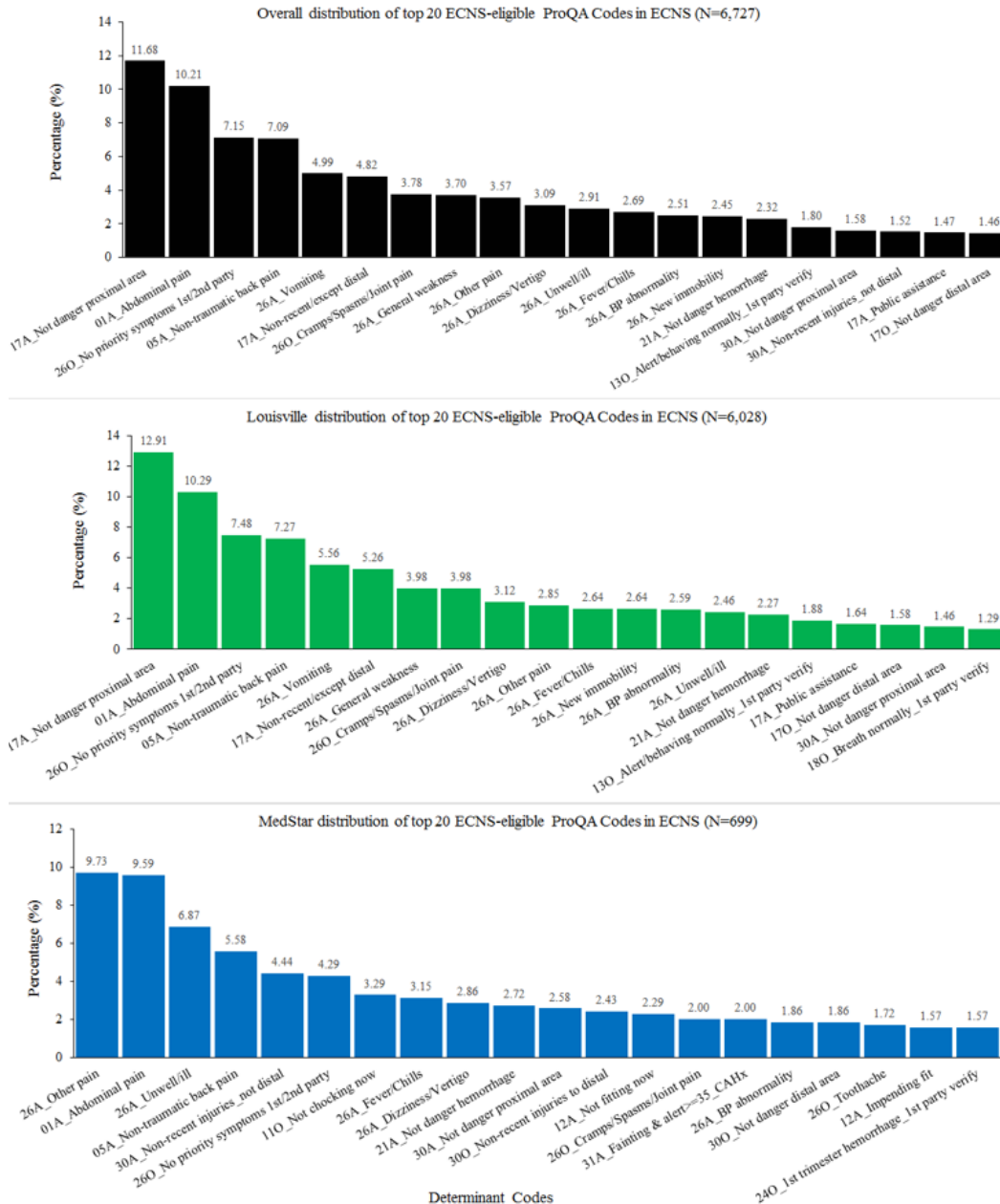
**Figure 2.** Distribution of top 50 ECNS-eligible ProQA Codes in ECNS

no associated high-risk symptoms) was the fourth most frequent code in both centers.

The ECN selected the Falls protocol most frequently overall (10.7%) (Figure 3). In LMEMS, Falls (11.9%) was also the most frequently selected protocol; however, in MedStar, Abdominal Pain (11.5%) was the most frequently chosen protocol. Abdominal pain was the second most frequent in LMEMS (9.7%), while Miscellaneous (8.2%) was the second most frequently selected protocol at MedStar. Back Pain was the third most frequent protocol in both centers (Louisville, 6.9%; MedStar. 7.4%). At LMEMS, Vomiting (5.6%) and Leg Pain (4.3%) were, respectively, the fourth and fifth most frequently selected protocols. However, at MedStar, Seizures (3.7%) and Headache (3.4%) were the fourth and fifth, respectively.

For female patients (N = 4,056), Abdominal Pain (11.6%) was the most frequently used protocol in the ECNS overall, followed by Falls (10.9%), Back Pain (7.0%), Vomiting (5.6%), and Leg Pain (4.1%) (Figure 4). For male patients (N = 2,671), Falls (10.4%) was the most frequently used protocol in the ECNS overall, followed by Abdominal Pain (7.3%), Back Pain (6.9%), Vomiting (4.3%), and Miscellaneous (4.3%).

## DISCUSSION

The study findings demonstrate the wide variety of low-acuity 911 cases transferred to the ECNs by the EMDs in the two centers studied. The five or six most
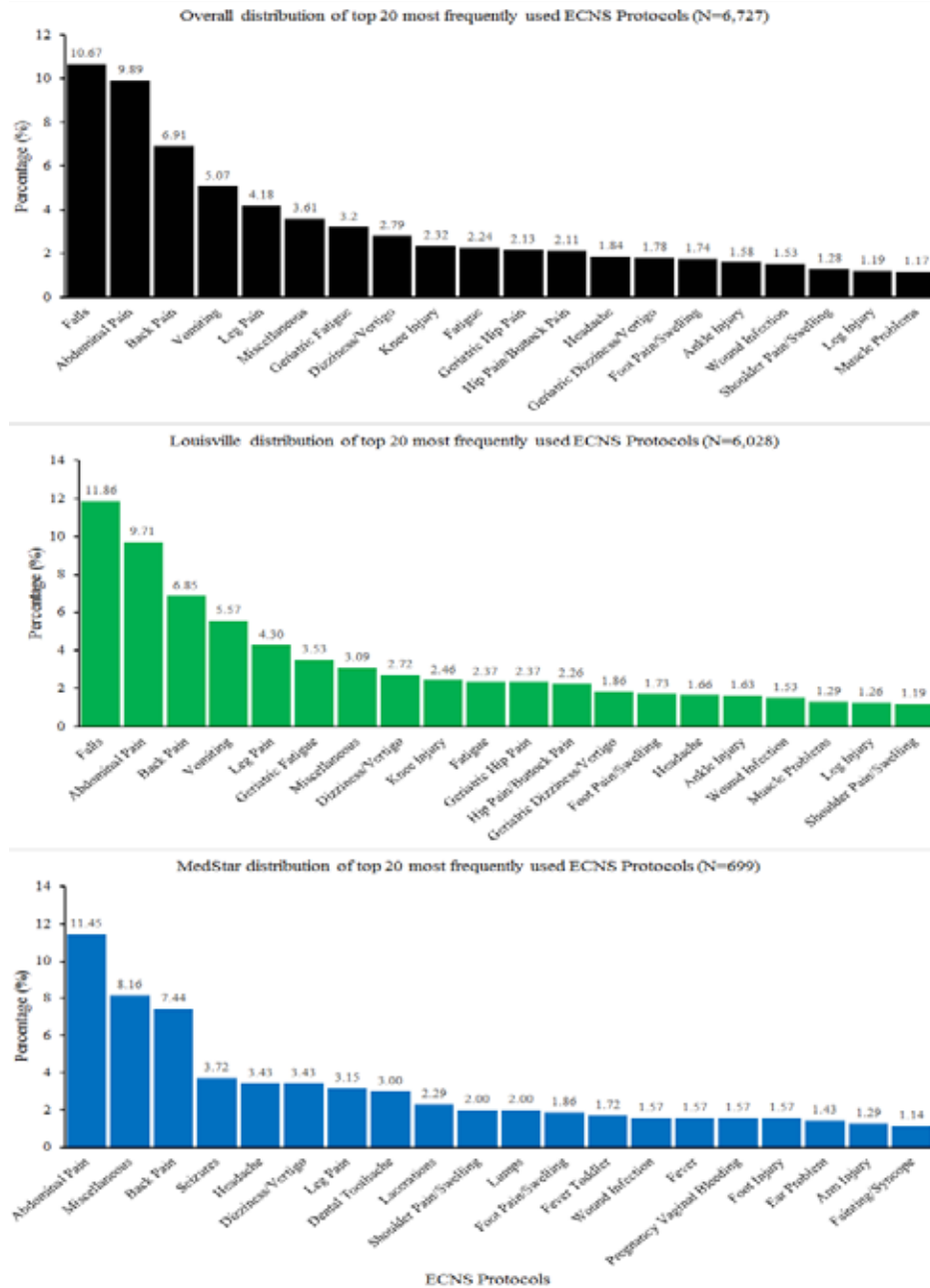
**Figure 3.** Distribution of top 20 most frequently used ECNS Protocols

frequently used protocols, in both the MPDS and ECNS, made up the majority of those cases. In the MPDS, the Sick Person and Falls protocols had notably high frequencies. Usually, a Sick Person coding of low-acuity is assigned by the EMDs when no more specific MPDS protocol can be identified, and no high priority symptom (see below explanation) or specific emergency condition is identified by the EMD in the initial problem description given by the 911 caller, nor in the subsequent Key Questioning sequence. High priority symptoms (known as priority symptoms in MPDS parlance) are: Breathing Problems, Chest Pain, Altered Level of Consciousness, and Severe Hemorrhage. Many common non-life-threatening chief complaints reported to the EMD were

handled using the (MPDS) Sick Person protocol. They included symptoms of general weakness, dizziness (without altered level of consciousness), body aches, non-traumatic extremity pain or pain from non-recent injuries, fever, chills, nausea, sore throat, vomiting, constipation, dysuria, diarrhea, high or low blood pressure without any priority symptoms, minor infections, rashes, and chronic gastrointestinal disorders, among others. Unpublished data (collected for routine system monitoring and evaluation) indicated that Protocol 26 (Sick Person) was, overall, one of the most frequently used in the MPDS (over 11% of all the cases)7 and that most of the Protocol 26 cases were coded by the EMD as ALPHA or OMEGA priority level (38% and 25%, respectively).
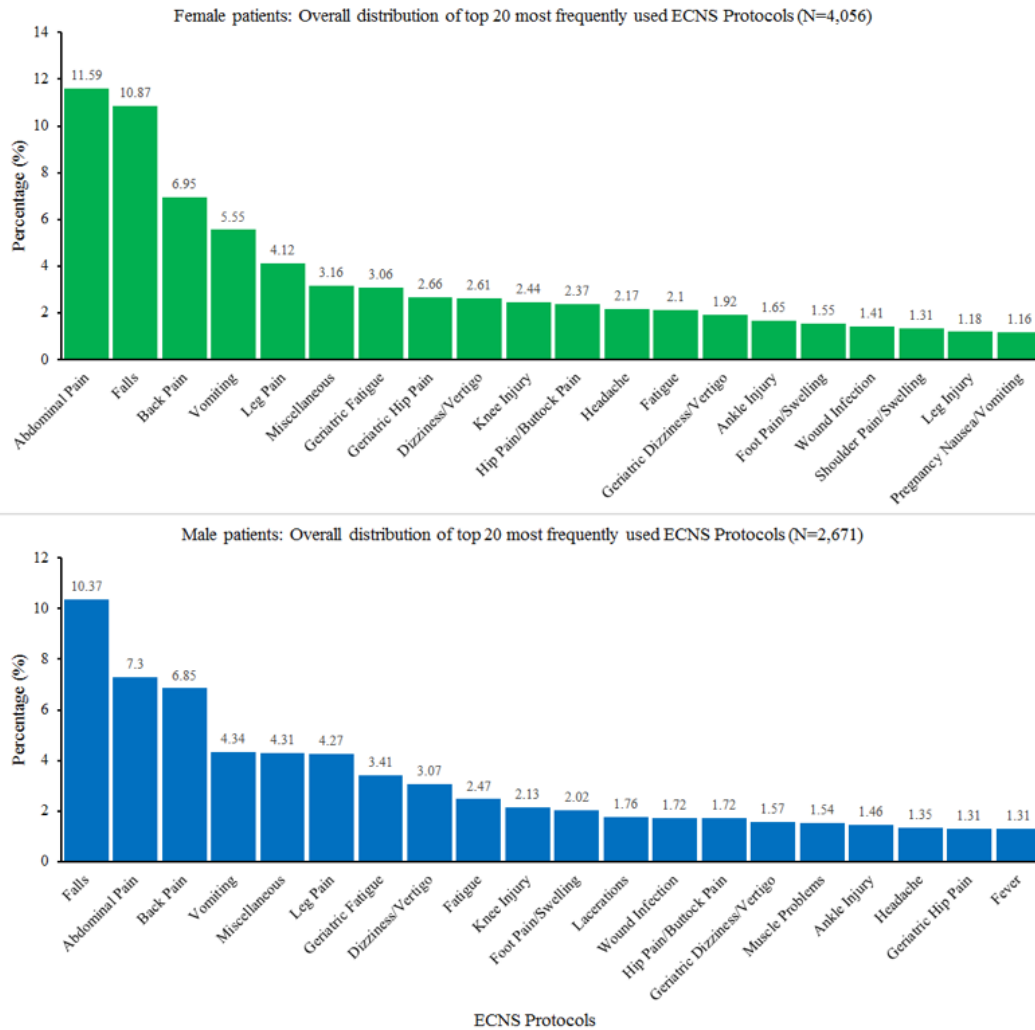
**Figure 4.** Distribution of the ECNS Protocols categorized by gender

When the patient had other, more specific signs and symptoms, the EMD did not use the (MPDS) Sick Person protocol; these signs and symptoms included abdominal pain, back pain, burns, traumatic injuries, minor injury traffic accidents, seizures, allergic reactions, accidental ingestions, and diabetic emergencies. Falls, the second most frequently used MPDS protocol for cases transferred to the ECN, yielded a mix of patients similar to Sick Person in triage priority; that is, most falls are ground-level or short-distance falls that result in minor injuries—or, in some cases, no identifiable injuries, only patient mobility problems. Again, unpublished data[7] indicated that cases recorded under the MPDS Falls Protocol made up approximately 10% of all cases handled in the MPDS, with over half (53%) triaged as ALPHA or OMEGA priority-level calls.

In the two study centers, Abdominal Pain was the third most common MPDS protocol selected for cases transferred to the ECN by the EMD, yet it was the most common protocol selected by the ECNs at Medstar and the second most common protocol at LMEMS. This apparent discrepancy may be explained by noting one of the fundamental differences between the MPDS and the ECNS: the MPDS includes 37 protocols for the EMD select from, while the ECNS has 211 protocols from which the ECN can choose. During the study period, approximately 78.0% of the available ECNS protocols were accessed at least once by an ECN. The ECN, being a trained and experienced caregiver, is expected to understand much more about the patient's condition than an EMD, and accordingly the ECNS includes many more very specific protocol choices from which to select.

For certain conditions (or signs and symptoms) where it is likely that the EMD would use the Sick Person protocol in the MPDS, such as constipation, diarrhea, cramps, nausea, and vomiting, it is possible that the ECN would select Abdominal Pain as the primary chief complaint. This is because pain in the abdominal region can be a common symptom for any of these conditions. However, future research is needed to determine exactly how the ECN makes a protocol selection and why that selection may differ from that of the EMD, given that both are speaking to the same caller (often the patient) within minutes of one another and that some of the common protocols are labeled in the same way for both the MPDS and ECNS (e.g. Abdominal Pain, Back Pain, and Falls).

Gender plays an important role in the mix of patients handled by the ECN. The results of this study indicated that female patient-callers used the ECNS in proportionately greater numbers than males. This finding is likely due to the high frequency of female-specific conditions that were not life threatening, but which present with a great deal of pain, clinical uncertainty, and mental anguish. Abdominal Pain, the ECNS CC protocol that had the highest percentage of female patients, serves as a good example. It is well documented that lower abdominal pain in females may include many female reproductive/urogenital system problems such as dysmenorrhea, vaginal or pelvic inflammation, endometriosis, ovarian cysts, uterine fibroids, ovulation pain, urinary tract infections, and pelvic adhesions, or complications of pregnancy.[9] In early pregnancy, the development of lower abdominal or pelvic pain with or without vaginal bleeding may indicate the presence of an ectopic pregnancy with potential rupture, or a threatened abortion (miscarriage).[10] The possibility of such serious problems suggests the value of secondary nurse triage for female abdominal pain patients, even those identified as low-acuity by the EMD.

Additionally, severe lower abdominal pain or cramping in the presence of third trimester pregnancy may indicate the onset of labor or reflect a complication of the pregnancy, or may be due to other conditions ranging from appendicitis to pyelonephritis.[11] Even when there is a more specific protocol available for the ECN to choose (e.g. dysmenorrhea), often the initial description of the problem is sufficiently vague to lead the ECN to choose the more general Abdominal Pain Protocol. And since the Abdominal Pain Protocol includes question sequences for all the major causes and conditions associated with abdominal pain, the ECN can arrive at the same final assessment, care level, and point of care decision as with a related protocol.

Vomiting, a second ECNS protocol with a large proportion of females (68.2%), is another symptom that can also be associated with female-specific conditions, including pregnancy, as well as many of the conditions mentioned above.

Further, the medical literature[12-17] indicates that—even setting aside the common female reproductive system issues— women are more prone to a host of painful, stress-inducing, non-life-threatening conditions including irritable bowel syndrome, severe constipation and bowel obstruction, gallstones, and fibromyalgia. Finally, women who have irritable bowel syndrome (IBS) and are more likely to seek healthcare because of IBS than are men with the condition.[17]

## LIMITATIONS

During the study period, ECNs did not staff either 911 center on an around-the-clock basis. ECN staffing was planned to cover the peak-load hours, typically between 7am and 9pm, Monday through Friday and some weekend days, varying by day, week, or month. Protocol distributions could have been different for both MPDS and ECNS

during off-peak hours, and no attempt was made here to quantify (ECNS-eligible) MPDS codes during those hours. Because the local system medical director approves the final list of (IAED-sanctioned) MPDS determinant codes for appropriate transfer to the ECNS, some differences existed between LMEMS and MedStar as to which MPDS cases were handled by the ECN (e.g., LMEMS passed more of the Falls determinant codes to the ECN than did MedStar). This restricted our ability to do a true unfiltered comparison of frequencies between both systems. This phenomenon most likely may have skewed this study's aggregate (overall) data in favor of one system (LMEMS) that allowed a greater number of MPDS codes for transfer to the ECN. Also, because we used a convenience sample, LMEMS had a longer data reporting period, adding to its larger number of cases in the study's overall sample.

## CONCLUSION

A variety of MPDS and ECNS Chief Complaint protocols are used for the triage and evaluation of low-acuity 911 calls. The Sick Person, Fall, and Abdominal Pain protocols are the most common problems (or chief complaints) transferred to the nurse by the EMD, while the Falls, Abdominal Pain, Back Pain, Vomiting, and Leg Pain protocols are the most commonly selected by the ECN. Female patient-callers were shown to be the more frequent users of the ECNS, with a particularly high-percentage usage of the Abdominal Pain and Vomiting protocols. Non-life-threatening, common, but painful conditions associated with the female reproductive system are likely a major contributor to the high percentage of females handled on these protocols. Further research should investigate the reasons for differences in protocol selection between the EMD and ECN, since both are speaking to the same callers within a short time frame. Finally, patient outcomes for different assigned ECNS and MPDS determinant codes should be examined to determine the predictability and value of the ECNS for specific conditions.

## REFERENCES

1. Shah, M, et al.: Validation of Using EMS Dispatch Codes to Identify Low-Acuity Patients Prehospital Emergency Care; 2005; 9:24-31

2. Richards JR, Ferrall SJ. Inappropriate use of emergency medical services transport: comparison of provider and patient perspectives. Acad Emerg Med.; 1999; 6:14-20

3. Camasso-Richardson K, Wilde JA, Petrack E. Medically unnecessary pediatric ambulance transports: a medical taxi service? Acad Emerg Med.; 1997; 4:1137–41.

4. Anderson B, et al. Diversion of 911 Poisoning Calls to a Poison Center. Prehospital Emergency Care; July/September 1998; Volume 2/Number 1

5. Neely KW. Ambulance transports: what are the alternatives? Acad Emerg Med.; 1997; 4:1103–6.

6. Gibson G. Measures of emergency ambulance effectiveness: unmet need and inappropriate use. J Am Coll Emerg Physicians; 1977; 6:389–92.

7. International Academies of Emergency Dispatch (IAED), Internal ProQA aggregate 911 system data, 2009 - 2014

8. International Academies of Emergency Dispatch (IAED), Internal ECNS data collection, 2010 - 2014

9. Shepherd SM, Karjane NW, Rivlin ME, Talavera F. Pelvic Inflammatory Disease. Medscape; 2014. http://emedicine.medscape.com/article/256448-overview. Accessed 5/28/2014

10. Sepilian VP, et al. Ectopic Pregnancy Clinical Presentation. Medscape; 2014. http://emedicine.medscape.com/article/2041923-clinical. Accessed 5/28/2014

11. Dawkins JC, et al. Acute Pyelonephritis in Pregnancy: A Retrospective Descriptive Hospital   Based-Study. Obstetrics and Gynecology; 2012. Article ID 519321

12. Andersen B, Nielsen TF. Appendicitis in pregnancy: Diagnosis, management and complications. Acta Obstetricia et Gynecologica Scandinavica; 1999; 78: 758-762

13. Taylor D, et al. Acute Abdomen and Pregnancy. Medscape; 2014. http://emedicine.medscape.com/article/195976-overview. Accessed 5/28/2014

14. Higgins PD, Johanson JF. Epidemiology of constipation in North America: a systematic review. American Journal of Gastroenterology. 2004; 99:750–759.

15. U.S. Department of Health and Human Services, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), National Institutes of Health, Health Information Services, Gallstones, July 2012

16. U.S. Department of Health and Human Services Office on Woman's Health, Fibromyalgia Fact Sheet, July 2012

17. Olafsdottir LJ, Gudjonsson, H. (2012) Natural History of Irritable Bowel Syndrome in Women and Dysmenorrhea: A 10-Year Follow-Up Study; Gastroenterology Research and Practice Volume 2012 (2012), Article ID 534204