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I AM THE DRAGOMAN: EMS TRANSLATIONS AND BOUNDARY OBJECTS IN NATIONAL PREPAREDNESS

by

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September 2018

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Emergency medical services (EMS) in the United States is highly localized, arising from the historical efforts of local entrepreneurs, with local resources, perceptions and expectations. Early EMS development was spurred by strong federal leadership and funding for capacity building, but since the early 1980s, EMS has suffered from an absence of both, resulting in a patchwork of thousands of persistent local EMS interpretations. This study evaluates EMS through the framework of Boundary Object Theory, demonstrating that EMS is what Star and Griesemer refer to as a "boundary object," around and within which multiple communities of practice interact. A case study of a local EMS agency as a community of practice demonstrates that it is indeed an organizational community of practice, and part of a larger EMS—and specifically *out of hospital* EMS community of practice. These communities of practice contribute to a coherent collective meaning of the EMS object at some analytical levels, but EMS perceptions do not scale from the local level to national preparedness policy. The consequences are discordant EMS preparedness policy and gaps in national preparedness, exacerbated by a lack of standardized methods and consolidated federal leadership for EMS. Recognizing out of hospital EMS as a discipline with a defined domain, its inclusion in preparedness policy development, and the return of federal leadership in EMS are recommendations.

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I AM THE DRAGOMAN: EMS TRANSLATIONS AND BOUNDARY OBJECTS IN NATIONAL PREPAREDNESS

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ABSTRACT

Emergency medical services (EMS) in the United States is highly localized, arising from the historical efforts of local entrepreneurs, with local resources, perceptions and expectations. Early EMS development was spurred by strong federal leadership and funding for capacity building, but since the early 1980s, EMS has suffered from an absence of both, resulting in a patchwork of thousands of persistent local EMS interpretations. This study evaluates EMS through the framework of Boundary Object Theory, demonstrating that EMS is what Star and Griesemer refer to as a "boundary object," around and within which multiple communities of practice interact. A case study of a local EMS agency as a community of practice demonstrates that it is indeed an organizational community of practice, and part of a larger EMS—and specifically *out of hospital* EMS community of practice. These communities of practice contribute to a coherent collective meaning of the EMS object at some analytical levels, but EMS perceptions do not scale from the local level to national preparedness policy. The consequences are discordant EMS preparedness policy and gaps in national preparedness, exacerbated by a lack of standardized methods and consolidated federal leadership for EMS. Recognizing out of hospital EMS as a discipline with a defined domain, its inclusion in preparedness policy development, and the return of federal leadership in EMS are recommendations.

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LIST OF ACRONYMS AND ABBREVIATIONS

ALS	Advanced life support
ACS	American College of Surgeons
AED	Automated external defibrillator
ANT	Actor-Network Theory
BLS	Basic life support
CAD	Computer aided dispatch
CARES	Cardiac Arrest Registry to Enhance Survival
CO	Colorado
COBRA	Consolidated Omnibus Budget Reconciliation Act
CORA	Colorado Open Records Act
CPR	Cardiopulmonary resuscitation
DOT	United States Department of Transportation
DHHA	Denver Health and Hospital Authority
DHMC	Denver Health Medical Center
DHS	United States Department of Homeland Security
ED	Emergency department
EMAC	Emergency Management Assistance Compact
EMRS	Emergency Medical Response System
EMS	Emergency medical services
EMSSA	Emergency Medical Services Systems Act of 1973
EMT	Emergency medical technician
EOC	Emergency operations center
EPCRA	Emergency Planning and Community Right-to-Know Act
ESF	Emergency support function
ESS	Emergency Services Sector
EVD	Ebola Virus Disease
FICEMS	Federal Interagency Committee on Emergency Medical Services
FT	Field training
GAO	United States Government Accountability Office
HEW	United States Department of Health, Education and Welfare
HHS	United States Department of Health and Human Services
HIPAA	Health Insurance Portability and Accountability Act
IAFF	International Association of Firefighters

IV	Intravenous
LEPC	Local Emergency Planning Committee
MHz	Megahertz
MCI	Mass casualty incident
MIH	Mobile integrated health
MVZ	Berkeley Museum of Vertebrate Zoology
NCR	Colorado North Central All-Hazards Region
NDMS	National Disaster Medical System
NEMSIS	National Emergency Medical Services Information System
NEMSMA	National Emergency Medical Services Managers Association
NHTSA	National Highway Transportation Safety Administration
NIH	National Institutes of Health
OEM/HS	Denver Office of Emergency Management and Homeland Security
OHCA	Out of hospital cardiac arrest
OHEMS	Out of hospital emergency medical services
POETE	Planning, organizing, equipping, training, and evaluating
PPD	Presidential Policy Directive
PSAP	Public Safety Answering Points
RETAC	Regional Emergency medical and Trauma services Advisory Council
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SHSGP	State Homeland Security Grant Program
SOS	System of systems
UASI	Urban Area Security Initiative
VST	Vehicle support technician

EXECUTIVE SUMMARY

I have worked in emergency medical services (EMS) for nearly thirty years, from working on an emergency ambulance, to leading an EMS agency, developing local, regional, state and national EMS policy, and applying it in the real world. I have developed a breadth and depth of experience in and knowledge of my work, and have come to believe that my experiences *are* knowledge. Inasmuch as I can substantiate their generalizability by analyzing them through a theoretical framework, can contribute an understanding of EMS to that stems from a critical examination of practical EMS experience. It is for these reasons that I write in the first person.

My twenty-five years of experience in the Denver Paramedic Division has engaged me in meaningful work that has transcended all levels of government. The Paramedic Division's community of practice, "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly,"[1] in which I am a member, and for which I am a translator, includes its own workflow and culture, and a socially constructed identity found in other organizations and healthcare settings.[2] As a community of practice, and part of the broader OHEMS community of practice, the Paramedic Division has its own, and contributes to broader perceptions of what EMS is and does as a boundary object.

The story of EMS' evolution in America reflects the influences of its historical development, federalism, politics, financing and governmental structures. Emergency medical services systems began to develop in an organized fashion in the late 1960s. Strong federal leadership and funding under the Highway Safety Act, the National Traffic and Motor Vehicle Safety Acts, and subsequently public Law 93-154, known as "The EMS Systems Act of 1973" (EMSSA), provided policy guidance for state and local jurisdictions

1. Etienne Wenger, "Communities of Practice: Learning as a Social System," The Systems Thinker, January 21, 2016, https://thesystemsthinker.com/communities-of-practice-learning-as-a-social-system/.

2. Jean Lave and Etienne Wenger, *Situated Learning: Legitimate Peripheral Participation* (Cambridge: Cambridge University Press, 2001). Lave and Wenger introduced the concept of communities of practice, which has inspired a large body of literature subsequently.

to develop EMS systems with the methods standardization framework of fifteen requirements, through the "carrot" of grant funding, and led to a rapid growth of EMS systems nationally.[3]

Prior to this act, ambulance services were primarily transportation services housed in hospitals, fire departments or funeral homes, with personnel who had little to no medical training, and no support or regulation, with the exception of only a few states.[4] These services reflected the efforts of local entrepreneurs and local resources and preferences, without centralized (federal) oversight or funding for building or sustaining EMS or EMS systems.[5]

Americans in towns and cities, and along its vast road networks, expect to be able to activate EMS through the standard emergency number, 911. Even outside of populated areas, there is often an expectation that "someone" will be there to help, including in the nation's parks and wilderness areas. What EMS means to Americans, however, differs widely across the country, and reflects their local interpretations, experiences and individual activities in the EMS "arena."[6] These perceptual differences are consistent with the interpretive flexibility of boundary objects. [7]

Star and Griesemer introduced the concept of "boundary objects" in their study of the organizational ecology of the Berkeley Museum of Vertebrate Zoology (MVZ).[8] The museum was a case study to identify how heterogeneous people and groups were able to successfully work together across different domains and "social worlds," without having

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3. Emergency Medical Services Systems Act, Public Law 93-154, *U.S. Statutes at Large* 87 (1973): 594–604; Institute of Medicine Committee on the Future of Emergency Care in the United States Health System.

4. Manish N. Shah, "The Formation of the Emergency Medical Services System," *American Journal of Public Health* 96, no. 3 (March 2006), 416.

5. Shah.

6. Adele E. Clarke and Susan Leigh Star, "The Social Worlds Framework: A Theory/Methods Package," The *Handbook of Science and Technology Studies* 3 (2008): 113-137.

7. Susan Leigh Star and James R. Griesemer, "Institutional Ecology, `Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39," *Social Studies of Science* 19, no. 3 (August 1, 1989): 393, https://doi.org/10.1177/030631289019003001.

8. Star and Griesemer, 387–420.

consensus about what the museum was.[9] To each actor, who represented individual passage points of information, work processes and translations to and from their respective communities, the museum meant something different.[10] None of these perceptions about what the MVZ was had primacy over the others, facilitating cooperation and coherent collective "meaning" of the MVZ, derived from the cooperative work and translated by its entrepreneurs.[11]

EMS' development as systems and their constituent communities of practice is an analogous tale of locally derived meaning. Thousands of local communities of practice are among the actors in collaborative EMS work at local levels that has resulted in variable meanings, performance and results within the boundary object of EMS.[12] In operations, regulation and preparedness doctrine, EMS has multiple identities, supporting the notion of interpretive flexibility across its diverse communities of practice. It is a component of healthcare, emergency services, and public health, and has stakeholders in these and many other groups, each of which translate their own meanings of EMS between and among them and to their respective constituencies.[13] At all levels of inquiry, the collaborative work from which EMS results, the interpretive flexibility it represents, and the ability for actors to "tack back-and-forth" between local and broader EMS interpretations make EMS what Star and Griesemer consider a "boundary object."[14]

EMS provides an object for targeted cooperative work across different communities of practice and disciplines. The majority of the stakeholders in EMS are aligned in

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9. Star and Griesemer, 388-90. Clarke and Star provide a much more detailed framework for interacting social worlds in their 2008 publication: "The Social Worlds Framework: A Theory/Methods Package."

10. Star and Griesemer, "Institutional Ecology, `Translations' and Boundary Objects," 390.

11. Star and Griesemer, 389.

12. Institute of Medicine, *Emergency Medical Services: At the Crossroads* (Washington, DC: The National Academies Press, 2007), 3.

13. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 390-91; "What Is EMS?" EMS, accessed August 7, 2018. https://www.ems.gov/whatisems.html.

14. Susan Leigh Star, "This Is Not a Boundary Object: Reflections on the Origin of a Concept," *Science, Technology, & Human Values* 35, no. 5 (2010), 605; Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 392.

disciplines with clear organizational and disciplinary domains and venues for their respective practices. However, those practicing the *discipline* of out of hospital emergency medical services (OHEMS), inasmuch as one exists, suffer from the ambiguity that the term "EMS" represents. EMS nationally reflects the efforts and translations of thousands of local entrepreneurs, connected by a common term and some initially standardized methods from the EMSSA.

National preparedness policy, based on translations of the EMS object from "experts" whose knowledge is prioritized above that of local OHEMS' situational knowledge, results in discordant scaling from locally defended perceptions of the EMS object that may not be coherent with the broader national preparedness policy perceptions.[15] This leads to policy based on cloudy expectations, false planning assumptions, and skewed actual and potential EMS capabilities.

In the realm of preparedness doctrine, multiple translations of the EMS boundary object, compounded by the absence of a lead federal agency with responsibility and authority for EMS, leave EMS in policy purgatory. In homeland security policy, EMS is a component of the nation's emergency services sector (ESS), over which the Department of Homeland Security (DHS) has responsibility.[16] In the National Preparedness Goal, EMS is part of the "response" mission area's "Public Health, Healthcare and Emergency Medical Services" core capability, under the leadership of Emergency Support Function 8's (ESF-8) lead agency, HHS.[17]

The only dedicated EMS office in the federal government is in the National Highway Transportation Safety Administration (NHTSA), a vestigial office from the 1960s translation of EMS as transportation, and the federal coordination body for EMS is

15. Paul R. Carlile, "A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development," *Organization Science* 13, no. 4 (August 1, 2002): 445.

16. "Emergency Services Sector," Department of Homeland Security. Accessed July 8, 2015. http://www.dhs.gov/emergency-services-sector.

17. "Core Capabilities," FEMA. Accessed August 23, 2018. https://www.fema.gov/core-capabilities.

the Federal Interagency Committee on Emergency Medical Services (FICEMS), which has a rotating chair, no funding, and no primacy of any agency over any other.[18]

The vague federal definition and the lack of methodological standardization are problematic for EMS capability and capacity in the national preparedness sense. They leave EMS as a commoditized transportation resource, a boundary object interpretation that may or may not scale from the local to the national level.

Although EMS personnel will be the first to respond in disasters with the other partners in the ESS, they are the least prepared component of community response teams, receiving the least training, funding, and inclusion in preparedness policy creation.[19] As of the date of publication for this thesis, there is no national policy requiring the delivery of EMS services, leaving states to this mandate, which only have four have done.[20]

A designated lead agency for the *discipline* of OHEMS, which disregards the delivery model, will support the development of reliable capabilities that correspond with the actual needs and capabilities of the OHEMS community of practice, rather than "abstract expectations."[21] This will result in more coherent preparedness policy, benefitting from the incorporation of OHEMS' situated knowledge. The nation needs a national dialog about emergency medical services in and among America's communities, rather than in narrow expert policy spaces. A dialog *with* policy makers and the other actors in the EMS to ensure "the public gains a sense of ownership over government decision making," revealing insights into appropriate levels of services, aligning expectations and

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18. See EMS.gov for information on NHTSA's office, and "Federal Interagency Committee on EMS," EMS, Accessed May 31, 2015. http://www.ems.gov/FICEMS.htm, for information on FICEMS. See also Frank J. Cilluffo, Daniel J. Kaniewski, and Paul M. Maniscalco, "Back to the Future: An Agenda for Federal Leadership," Washington, DC: George Washington University, 2005, 12.

19. Institute of Medicine, Emergency Medical Services, 4.

20. M. Van Milligan et al., *An Analysis of Prehospital Emergency Medical Services as an Essential Service and as a Public Good in Economic Theory,* Report No. DOT HS 811 999a (Washington, DC: National Highway Traffic Safety Administration, 2014), 11.

21. John Seely Brown and Paul Duguid, "Organizational Learning and Communities of Practice: Toward a Unified View of Working, Learning, and Innovation," in *Knowledge and Communities*, 106, Science Direct, 2000, https://doi.org/10.1016/B978-0-7506-7293-1.50010-X.

providing opportunities for stakeholders to create new shared meanings and their translations into new EMS objects.[22]

22. Cliff Oswick et al., "Codesigning as a Discursive Practice in Emergency Health Services: The Architecture of Deliberation," *The Journal of Applied Behavioral Science* 46, no. 1 (March 1, 2010), 75-76.

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I. INTRODUCTION

> The "indeterminacy [of knowledge] arises because *the meaning of knowledge is given in its consequences*, in a community of listeners, not in its *a priori* analytic specification."[1]
>
> —Susan Leigh Star

I have worked in emergency medical services (EMS) for nearly thirty years; from working on an emergency ambulance to leading an EMS agency. I have developed local, regional, state and national EMS policy, and applied it in the real world. I have been blessed over my career to cultivate relationships with people across the spectrum of communities, the interactions with whom have contributed to the breadth and depth of experience in and knowledge of my work. I consider myself a broker—someone with enough legitimacy in my own knowledge to get an audience, and with enough distance from other communities to learn from them and bring knowledge back to EMS, bridging boundaries between communities.[2]

While my understanding of EMS is admittedly filtered through my experience in the Denver Paramedic Division, in which I have worked for the past twenty-five years, my engagement in meaningful work has transcended all levels of government and numerous communities of practice. In the academic pursuit of a master's degree, I have attempted to minimize my experiences—my practical knowledge, prioritizing objective knowledge instead. Through these academic pursuits, however, I have come to believe that my experiences *are* knowledge.

I am not alone in this assertion, as other practitioners in technical endeavors with whom I have worked consider their experiences knowledge as well. In EMS, the body of theory is scant, and my experiences, inasmuch I can substantiate their generalizability, can

1. Susan Leigh Star, "The Trojan Door: Organizations, Work, and the Open Black Box?" *Systems Practice* 5, no. 4 (August 1992): 395–410.

2. Etienne Wenger, "Communities of Practice and Social Learning Systems," *Organization* 7, no. 2 (May 1, 2000): 235–36.

contribute an understanding of EMS to that stems from a critical examination of practical EMS experience. If I am able to successfully analyze experiences as knowledge through a theoretical framework, I may be able to understand how to apply this knowledge at different levels of analytical and practical scale to improve EMS and national preparedness. It is for these reasons that I will write in the first person.

My perceptions of what my "discipline" is and does, insomuch as one exists, do not necessarily mirror those of other partners and stakeholders in the collective endeavor of what is generally referred to as emergency medical services. The actors working together in the cooperative EMS endeavor resolve local perceptual tensions through different mechanisms for shared meaning that range from regulations, to perceptions that are unspoken and or negotiated "agreements."[3] Actors in EMS, in whatever their individual and group endeavors and identities may be, have strong locally derived perceptions about what they do and what EMS is to them.[4] I believe these differences in perception are a challenge to EMS' development as a recognized discipline and make EMS policy initiatives difficult at the local, regional, state and federal levels.

A. WHAT IS EMS?[5]

This is likely not a question most people would ask themselves, thinking little of it unless they work within, have had prior contact with the services, or unless they happen to require emergency assistance. Americans in towns and cities, and along its vast road networks, expect to be able to activate EMS through the standard emergency number, 911.

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3. Susan Leigh Star and James R. Griesemer, "Institutional Ecology, `Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39," *Social Studies of Science* 19, no. 3 (August 1, 1989): 387, https://doi.org/10.1177/030631289019003001. Star and Griesemer introduce the term "actor" on p. 387, and define it as such: "actors - researchers from different disciplines, amateurs and professionals, humans and animals, functionaries and visionaries," to make the point that scientific work is heterogeneous. They go on to use it interchangeably with "entrepreneur," (389.). I use the term to describe the heterogeneous groups and people working together in an endeavor.

4. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 390. Interpretive flexibility is a key characteristic of boundary objects, and will be discussed further.

5. I have made the semantic choice to use EMS as a singular with no article. I refer to my work as such, as do others, but the interpretive flexibility of the term and what it represents support my assertion that both the work and the word, are boundary objects.

Even outside of populated areas, there is often an expectation that "someone" will be there to help, including in the nation's parks and wilderness areas.

A semantic dissection of the term "emergency medical services" reveals some of its characteristics, ambiguity and complexity. Merriam Webster's Dictionary defines "emergency" as "an unforeseen combination of circumstances or the resulting state that calls for immediate action."[6] Time sensitivity and action are key outputs of most EMS systems. They deliver some sort of response, with urgency. The terms "medical" and "services" imply the rendering of some sort of medical care or logistics, and in the EMS case, in the context of an emergency. Tellingly, Merriam Webster has no definition for the whole term "emergency medical services."

People's interpretation of what EMS is and does may be transitional, as it likely means something different to them when they are members of the general public, are in crisis, are 911 callers, are bystanders to a (perceived) emergency, are recipients of a bill for service, or are medical patients. Local EMS policy choices also appear to reflect different community interpretations of what EMS is and does. But there is general agreement on one EMS output—fundamentally, EMS responds. Its trigger for action is a request for help, which may take the form of an emergency number call, a request for support form a partner agency, an Emergency Management Assistance Compact (EMAC) request, or a federal disaster declaration. EMS responds. That EMS responds does not seem to be an area of conflict across domains or levels of analysis.

Despite this agreement, however, what "responding" means may be a discursive object itself. To a dispatcher, a response may be taking a call for help and dispatching the appropriate response personnel and apparatus. To a paramedic, a response may be receiving the dispatch information, driving an ambulance with lights and sirens to an address, and caring for a patient. To an emergency department nurse, a response may be taking the notification call from the paramedics that the ambulance is en route and organizing a team and a room in the emergency department (ED) for a patient. For the

6. *Merriam-Webster,* s.v, "emergency," Accessed August 21, 2018. https://www.merriam-webster.com/dictionary/emergency.

trauma surgeon, the response may be initiated by a pager, notifying him or her that the incoming patient is potentially critical, and to mobilize the operating room team, and to go to the ED to see the patient upon arrival.

All of these actors are providing emergency medical services in the semantic sense, but their perceptions about what it is and what they and others do within it, are diverse. They may not even define what they do as "EMS." The domain of EMS is equally vague and encompassing, as the care EMS provides occurs in austere environments, public spaces, in people's homes, in helicopters, clinics, hospital emergency departments and other venues.

As someone who has participated in the discussions, the work of being a paramedic, the thinking about the work at all levels—practitioner, leader, and policy advocate, and the work to implement changes to the work in response to those discussions and ideas, I have experienced perceptual mismatches around EMS across different groups, governmental levels and hierarchical levels. I have frequently said things like, "This doesn't make sense," "We're not talking about the same thing," or "That isn't what we do." I have done my best to translate what I believe EMS is to others, and negotiate its roles and capabilities with them to facilitate cooperation.

I try to simplify what I believe is a complex system of systems into something that will allow me to work together with others for the benefit of actual and potential patients.[7] In my early EMS leadership experiences, I attributed these perceptual differences to the unique characteristics and structures of my own service, in the context of my own sub-state region. The more I interact with my colleagues from around the country and the world, however, the more I realize that EMS in the United States has an identity problem. It is a problem because the local translations of EMS meaning do not scale to the national preparedness policy level.

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7. Dan DeLaurentis and Robert K. Callaway, "A System-of-Systems Perspective for Public Policy Decisions," *Review of Policy Research* 21, no. 6 (November 1, 2004), 831. DeLaurentis and Callaway define system-of-systems as: "generally have the following distinguishing traits: physically distributed systems, prime dependency of overall functionality on linkages between distributed systems, and system heterogeneity, especially the inclusion of sentient systems, for example, thinking and evolving individuals or organizations,"

EMS people are adept translators, in my experience—poised at the juncture between the complexities of medical science, the urgency of physical trauma, and the complexities of individuals across all American cultural backgrounds. We interact with multiple communities of practice every day and are rarely "in charge," requiring us to negotiate often with others to create understanding, to accomplish our individual and collective goals, on behalf of the people we are serving. In my own practice, I regularly act as a translator of EMS meaning to others through formal and informal conversations, to help create a shared meaning, and to try to facilitate cooperation.[8]

These conversations with the lay public, with the community, with my peers, with my patients, with other responders, with paramedic students, with trainees, and other "locals;" in local, regional, state, national and federal policy discussion forums; have taken place in dark alleys, meeting rooms, emergency departments, people's homes, and the White House. I have tailored the meaning of EMS in each, and tried to communicate it to others to help them make sense of the current state of my practice as an EMS provider who is at the "point of the spear," and what it means for advancing or creating my profession. [9] I consider myself "an EMS guy," as I have spent my entire adult life in the endeavor, and my dedication to my community, my colleagues, my work, and the desire for sensemaking has been the impetus for this inquiry.

B. WHAT IS EMS TO ME?

I believe EMS represents a social contract with the people it serves. The contract is transactional—with the public's trust being its currency, and the reliability of timely, expert, compassionate emergency care to actual *or potential* patients being the EMS currency. The exchange informs and influences interactions at multiple levels. EMS across the nation looks different from community to community, presumably based on history, resources, policy choices, and expectations, but I see the same transactions occurring everywhere, and at all levels of scope and scale.

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8. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 390.

9. Susan Leigh Star, "This Is Not a Boundary Object: Reflections on the Origin of a Concept," *Science, Technology, & Human Values* 35, no. 5 (2010), 601.

An ambulance arrives at the address at 02:37 in the morning. The crew takes their kits out of the vehicle and carries them to the front door, where they are met by a woman in her thirties, motioning them into her home. The home appears "lived in," with remnants of a meal on the coffee table, empty drink cups on side tables, and toys on the floor. She is wearing a bathrobe, her hair unkempt, and she tells the crew that her baby is sick. She leads the crew to the baby's room, picks the child up and hands the baby to the paramedic, who asks the mother questions about the baby's health and recent activity, undresses the baby and performs a physical examination of the child while the mother watches. The other crew member looks through the medicine cabinet for medications or other clues to what might be wrong with the child.

At the same time, in another town, paramedics are leaning into the broken windows of an overturned car in the rain, trying to assess the victim of a rollover automobile accident. With the assistance of fire department personnel, they extricate the patient from the vehicle while law enforcement officers control traffic around the accident. The paramedics take the patient to their ambulance on a stretcher, cut the patient's clothing off, and perform a hands-on trauma assessment, asking the patient about whether or not she could be pregnant, whether she has used drugs or alcohol, and what kinds of medical problems she has. She is verbally abusive, intoxicated and spitting blood at them, requiring the crew to restrain her to the stretcher.

Scenarios like these play out all over the United States, thousands of times a day every day, each involving an incredible degree of trust. Trust to allow complete strangers into one's home without cleaning up or preparing for their arrival, to hand a stranger one's baby, to answer questions that one might not answer for the closest of friends or family, to allow EMS personnel to undress, visually examine and palpate, and treat them with needles, unfamiliar intravenous (IV) fluids and medications, and on. Trust to allow them to act on the public's behalf when an individual's decision-making faculties are impaired. A vulnerable populace grants this trust to EMS personnel freely, in a time of need, without real-time vetting of the people or systems delivering these services.

I did not always think EMS was about trust. My perspectives on what EMS is, does and should do have evolved as I have grown up within the community it represents to me.

It started for me as something interesting and exciting to do. I enjoyed medicine and liked people. EMS was something noble to do that satisfied my desire to help others and have a steady stream of unpredictability and novelty in my work. I learned what EMS was, from and with other people.

I happened into it by accident, during a serendipitous break from undergraduate studies to work full-time to earn enough money to go back to school. I decided to enroll in emergency medical technician (EMT) training with a friend who was planning to enroll with the hopes of being a firefighter. I asked him what EMT training had to do with firefighting, and he told me that "If you have your EMT, you have a better chance of getting hired." I had no desire to be a firefighter, but my craving for intellectual stimulation during this hiatus from college was enough to register for the course. EMT school was the spark that ignited a passion for helping others, for the excitement of being an emergency responder, and for the practice of medicine.

Initially, the allure was the unpredictable nature of the work, the camaraderie of the people, and the selfish feeling of being "needed" by the people whom I was serving. The practice of out of hospital emergency medicine entails a binary relationship between inactivity and moments of great excitement and tension. For me, the tension was enticing and drew me into the community. I wanted to be a part of it, I wanted to be an expert in it.

The draw of being an EMS provider led to my spending many more hours and days volunteering for a local ambulance service as an EMT than working for pay, and delayed my return to college.[10] The volunteers in my service taught me what EMS is and does. They taught me everything about operating an emergency ambulance in the service, how to use the equipment, to drive with lights and sirens on, how to route to calls, and more—none of which I learned in EMT school, other than some basic familiarization with equipment and some basic interviewing and assessment techniques.

10. I am using the term "provider" here in its semantic sense, as one who provides. Provider, in the Center for Medicare Services medical payment system is a category of medical professionals and services, in which EMS is not included. It is also a common term of reference for physicians in the healthcare sector.

Doing the job with other people taught me to do the job, through the shared experience of doing it together. It also taught me about what it meant, and still does. As a scientific and "artistic" endeavor, the medical care part of the job required a working knowledge of medicine, anatomy and physiology, pharmacology, and more. I loved the academic pursuit of knowledge as well, and I devoured everything I could get my hands on about medicine and EMS. I found EMT work to be fun and rewarding, but the limited scope of EMT practice left me with the desire to do more, and led me to pursue paramedic training. Being a paramedic would provide me a better living and an opportunity to finally make enough money to return to pre-med studies and to support myself while going to school. Paramedic school was rigorous and difficult, mostly because it was in addition to twenty-four-hour ambulance shifts in a busy district where I got little rest at work.

Paramedic studies fueled my passion for medicine even more, and while the studies were all-consuming, I was able to put the book knowledge into practice every day at work, to get real-time feedback, and to make mistakes under the watchful eye of a paramedic preceptor, who acted as my safety net. It was during internship rides and my work with a paramedic partner that really helped me comprehend the work. I eventually graduated from paramedic school and promoted to paramedic, the lead on an ambulance, which presented a mix of elation and terror, for now I was the one with the responsibility and authority to make the final medical decisions during each patient encounter, within the bounds of my medical protocols.

EMS afforded me a great laboratory for personal, professional and intellectual growth. I was constantly exposed to other members of the public, the public health, medical and public safety communities; to environments and people I would have likely never experienced as a middle-class kid from the suburbs; and to the scientific approach of medicine. It provided plenty of grist for my intellectual mill and my experiences were formative in my growth as a paramedic and as an adult. My competency and learning as a

paramedic ascended the Bloom's Taxonomy pyramid, shaped my worldview, and revealed to me why my stepping-stone job to get me to medical school ended up being my career.[11]

The allure and meaning of the work, originally derived from what it could provide me, also evolved. I found myself more interested in the relationship between me and the people I was serving, than in the individual interactions with them. After a lot of time spent doing EMS work, I have come to the conclusion and deeply held belief that trust is what being a paramedic is all about. It is the foundation for everything in EMS from the isolated patient contact, through national EMS public policy decisions.

While I have found its deeper meaning in trust, my *definitions* of EMS are transitional, changing with the scope, activities and nature of the localized work at the time. In this sense, EMS is a personal boundary object. As the aperture opened from the single incident patient encounters to organizational roles in the city and county, the Colorado North Central All-Hazards Region (NCR), the State of Colorado, and in national policy, my perceptions about what EMS is at differing levels of scale have evolved.[12] EMS' representation is different depending on the scale and whether the discussion is around a practice, a service, a capability or a resource. These definitions are contextual. EMS is not merely my job, but what I consider my discipline. I find that I have to reconcile these differences for myself, and then translate a particular appropriate contextual meaning to others, in the interests of cooperating.

The EMS of which I am a disciple, happens outside of the walls of any hospital. It happens in the field, and it is raw, dirty, dangerous, humbling and exhilarating.[13] I believe

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11. "Bloom's Taxonomy," Vanderbilt University, June 10, 2010. https://wp0.vanderbilt.edu/cft/guides-sub-pages/blooms-taxonomy/.

12. "North Central All-Hazards Region," NCR, Accessed August 22, 2018. http://www.ncrcolorado.org/.

13. Michael W. Smith, "Utilizing Control in Emergency Medical Services: Expertise in Paramedics" (PhD Diss, Ohio State University, 2010), 13. Smith, in his doctoral thesis, adopts the same definition of EMS as the author- primarily that it occurs outside of a facility in the field. A similar definition can be found in Institute of Medicine, *Emergency Medical Services,* "Emergency medical services, or EMS, denotes prehospital and out-of-hospital emergency medical services, including 9-1-1 and dispatch, emergency medical response, field triage and stabilization, and transport by ambulance or helicopter to a hospital and between facilities. EMS system refers to the organized delivery system for EMS within a specified geographic area—local, regional, state, or national—as indicated by the context," 25.

the EMS I practice, out of hospital EMS (OHEMS) can be part of a larger EMS system, but its community is unique from other people and practices and from other medical care endeavors. The community has its own expectations and rites of passage for bringing new members into the community, and its own terminology and artifacts. The EMS I practice is a discipline. It is more than a vehicle, more than transportation, and its adherents are more than taxi drivers. I am certain that I am not alone in my assertions or my goals of establishing OHEMS as a discipline, and improving the services we provide to a trusting public.

My perspectives are those of one "translator" or "entrepreneur," in Star's and Griesemer's descriptions of boundary objects, and one "passage point" in the collaborative work of what I believe to be the boundary object that is EMS.[14] These personal perspectives and interpretations of the object, shaped by my experiences and reflecting assorted biases, include:

- The EMS care provided outside of the walls of a facility (OHEMS) is distinct from "EMS systems," and is a separate discipline.
- OHEMS is a clinical medical endeavor, and the care it provides does not necessarily include transport.
- OHEMS is a public safety response endeavor.
- OHEMS should be categorized as a critical public service.
- Out of hospital EMS providers have their own domain and discipline.
- Out of hospital EMS should develop and communicate its body of knowledge within its and to other communities of practice.

These are interpretations informed by decades of EMS work, but do not necessarily reflect consensus interpretations of EMS, or the ideal one. They are derived from working with others at differing levels of scale, are influenced by others' translations, and are

14. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 390-91.

plastic. Interpretive flexibility is a characteristic of boundary objects, as Star and Greisemer describe, but only one characteristic. As such, EMS' status as one is not a foregone conclusion. By looking at EMS through the lens of Boundary Object Theory, I will discern whether or not the theory, regardless of whether or not EMS ultimately is a boundary object, can inform EMS and other preparedness and operational implementation activities, the policy surrounding them, and the evolution of EMS as a discipline.

C. PROBLEM STATEMENT AND METHODOLOGY

With differing perceptions of EMS from the public, the response community, the medical community, the public health community, policy makers and others, it is a wonder that the country has any organized EMS systems, as it does. It begs the question, however, "How do such widely varying perceptions coalesce into meaningful work in the EMS space?"

In operations, regulation and preparedness doctrine, EMS has multiple identities, supporting the notion of interpretive flexibility across its diverse stakeholders. It is a component of healthcare, emergency services, and public health, and has stakeholders in these and many other groups, each of which translate their own meanings of EMS between and among them and to their respective constituencies.[15] These multiple translations make clearly defining EMS difficult, but perhaps unnecessary, in many ways. Collaborative work continues in and around EMS without consensus about a definition.[16] In policy and doctrine, however, this lack of clarity has the potential to cloud expectations, create false planning assumptions, and skew OHEMS' actual and potential capabilities.

While there seem to be some areas of general agreement around the function and purpose of OHEMS, it means different things across the milieu of stakeholders. The differences in perceptions and meanings have both benefits and drawbacks, depending upon the scope and work happening. The interpretive flexibility about what OHEMS is,

15. Star and Griesemer, 390-91.

16. Star and Griesemer, 388.

does and should do crosses varying domains and levels, and reflects local interpretations and work arrangements.[17]

Where EMS fits into the broader national preparedness policy framework may or may not reflect these local interpretations. Across varying levels of government, EMS policy is not aligned. How can work go on in a meaningful and productive way in the EMS policy space, without some agreement about what it is? In my experience, there is not a unity of policy that results in a unity of effort between local interpretations of EMS and state and federal ones. Why is this, and how can Boundary Object Theory inform observations of relationships at the local, regional, and national level between EMS and its stakeholders?

This thesis will analyze EMS, as currently understood, through the theoretical framework of Boundary Object Theory at different levels, to ascertain whether or not EMS and OHEMS are indeed boundary objects, which is my hypothesis. This will include my translations of meaning as an individual actor and as part of an organization, as part of a larger group of practitioners, and scale out to the more ethereal EMS preparedness policy space. The thesis will explore whether Boundary Object Theory can provide a lacking theoretical underpinning to the understanding of a burgeoning discipline, and a clearer path to successful implementation of OHEMS policy and operations.

The Denver Paramedic Division will be a boundary object case study, to explore how meaning is translated both within it and to others at the local, sub-state region, and national levels, including within the Denver Health and Hospital Authority (DHHA), and what generalizations might be made about EMS in Denver and other locations. Boundary objects are associated with interpretive flexibility, among other characteristics, and the inclusiveness of local interpretations of what EMS is and does, makes developing national policy difficult, as it is difficult to craft policy around an undefined object.

I posit that local interpretations emerging from cooperative work, and the boundary objects they represent are strong and enduring, making more global policy implementation

17. Star, "This Is Not a Boundary Object," 602-04.

surrounding EMS even more difficult. The thesis will explore this set of conditions to see what potential solutions might exist within or resulting from the theoretical framework, and how they may inform policy implementation in EMS and other areas of out of hospital EMS emergency preparedness and response.

Star and Griesemer introduced the concept of boundary objects in their analysis of cooperative scientific work in the absence of consensus. They describe the importance of "entrepreneurs" in the development of boundary objects—the people/groups cooperating through the ill-structured work arrangements that are the boundary object, and who translate their local interpretations of its meaning to other constituents and "allies."[18] If EMS is indeed a boundary object, I am one of its entrepreneurs, and for even me there are multiple locally-derived meanings of what EMS is, depending on the scope of the work going on at various levels. The ambiguity is a cause of my consternation, and is certainly a cause for my inquiry.

D. LITERATURE REVIEW

1. EMS Historical Development

The story of EMS' evolution in America reflects the influences of its historical development, federalism, politics, financing and governmental structure. EMS is quite varied from one place to another nationally. Emergency medical services systems began to develop in an organized fashion after the release of the National Academy of Sciences white paper *Accidental death and disability: the neglected disease of modern society*, in 1966.[19] The report represented years of increasing attention on the subject of traffic safety and traumatic injury, and resulted in public outcry and political attention that led to eventual congressional enactment of the Highway Safety Act and the National Traffic and Motor Vehicle Safety Acts. These laws mandated regulatory and public safety measures for the traveling public, and put the Department of Transportation (DOT), a cabinet level

18. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 390-391.

19. National Academy of Sciences and National Research Council Committee on Shock, *Accidental Death and Disability: The Neglected Disease of Modern Society* (Washington, DC: National Academies Press, 1966), https://www.ncbi.nlm.nih.gov/books/NBK222962/.

department, in the lead to address the issues. The two acts established standards for states, using the lever of federal funding for highways to drive states' compliance with the standards.[20]

President Kennedy's political focus on the problem of vehicle safety and vehicle accident trauma, and the later elucidation of the problem of traumatic injury by the National Academies report, led to political and fiscal support for the DOT to address the trauma problem the way that the development of Regional Medical Programs dealt with pervasive medical problems like cancer and heart disease.[21] In a complementary action to the preventive safety focus of the Highway Safety Act and the National Traffic and Motor Vehicle Safety Acts, congress focused on the post-injury survival from traumatic injury through the passage of public Law 93-154, known as "The EMS Systems Act of 1973" (EMSSA).[22] The convergence of these political and public opinion issues brought to light in *Accidental Death and Disability* supported the growth of EMS systems and the eventual enactment of the EMSSA.

The enactment of The EMSSA designated the Department of Health, Education and Welfare (HEW) as the lead federal agency for EMS, shifting this role from, but in cooperation with the DOT. The EMSSA provided policy guidance for state and local jurisdictions to develop EMS systems with a framework of fifteen requirements, through the "carrot" of grant funding to encourage standardization and effective system design, much the same way that the Highway Safety Act did for highway systems.[23]

This policy action in itself demonstrated the importance of the medical endeavors in EMS systems, a result of the focus on traumatic injury in the National Academies report,

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20. National Traffic and Motor Vehicle Safety Act of 1966, Public Law 89-563, *U.S. Statutes at Large* 80: 89-56; Manish N. Shah, "The Formation of the Emergency Medical Services System," *American Journal of Public Health* 96, no. 3 (March 2006): 414–23. See also

21. "The Regional Medical Programs Collection: Brief History," National Institutes of Health, http://profiles.nlm.nih.gov/ps/retrieve/Narrative/RM/p-nid/94.

22. Emergency Medical Services Systems Act, Public Law 93-154.

23. Emergency Medical Services Systems Act. See also Frank J. Cilluffo, Daniel J. Kaniewski, and Paul M. Maniscalco, "Back to the Future: An Agenda for Federal Leadership," Washington, DC: George Washington University, 2005, 7-8.

and the subsequent improvements in medical care throughout the 1960s.[24] It provided the Secretary of HEW authority over EMS systems as the lead federal agent, through the statutory language: "The Secretary shall by regulations prescribe standards and criteria for the requirements prescribed by this subparagraph. In prescribing such standards and criteria, the Secretary shall consider relevant standards and criteria prescribed by other public agencies and by private organizations."[25]

Prior to this act, ambulance services existed across the country, and reflected the efforts of local entrepreneurs and local resources and preferences, without centralized (federal) oversight or funding for building or sustaining EMS or EMS systems.[26] A common locally derived meaning about what EMS was at this time was a responding ambulance service, housed in hospitals, fire departments or funeral homes using hearses—vehicles that allowed for the transportation of a supine person and an attendant in the back of the vehicles. At this time in the early 1960s, most ambulance personnel had little to no medical training, and ambulances and medical training were unsupported and unregulated by all but only a few states.[27]

In the ambulance services of the day, there was little actual emergency care being provided, and ambulance service was primarily a transportation endeavor. The DOT's early engagement in EMS is not surprising, considering the "meaning" around EMS as a transportation service, the National Academies report that attributed such a grave trauma picture to American highways and motor vehicles, and the highway safety legislation.[28] The perception of EMS as transportation has demonstrated remarkable persistence and enduring federal EMS policy implications, despite the evolution of ambulance transport

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24. Shah, "The Formation of the Emergency Medical Services System," 414-16.

25. National Academy of Sciences and National Research Council Committee on Shock, *Accidental Death and Disability.*

26. Shah, "The Formation of the Emergency Medical Services System," 416.

27. Shah.

28. Shah, 416-17. Prior to the EMSSA, federal responsibility for EMS was assigned to the DOT, which supports the federal view at the time that EMS was more about transportation than medical care. See also Institute of Medicine, *Emergency Medical Services,* 6-7.

services to systems providing emergency response, mobile emergency care and transport services, and more.[29]

2. Boundary Object Theory

Star and Griesemer, in their 1989 paper, "Institutional Ecology: 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39," the authors explored the institutional dynamics of different people, groups, roles and activities in the MVZ.[30] The authors studied the organizational ecology of the museum to identify how heterogeneous people and groups were able to successfully work together across different domains and "social worlds," without having consensus about what the museum was.[31] To each, the museum meant something different, and each represented a passage point of information, meaning and work processes to and from their respective constituencies, which had more local interpretations of what the museum was to them.[32] None of the cooperating actors' interpretations had primacy over the others, facilitating their cooperation.[33] The coherent "meaning" of the MVZ arose from the cooperative work, as derived from and translated by its entrepreneurs.

Through the collaborative work processes in the MVZ, governed by the methods standardization of the curator's detailed specimen processing guidelines, all of the actors could contribute to the boundary object of the museum which locally, they each saw as something different. Collectively, however, the museum represented the result of their cooperative endeavors, and these differing interpretations of the MVZ did not hinder cooperative work, but rather *allowed* for it. It was the museum to all, but the local meanings reflected the diverse perceptions of the cooperating actors.

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29. National EMS Advisory Council, *Alignment of EMS Guidance Documents* (Washington, DC: National Highway Traffic Safety Administration, 2016), 1-3.

30. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 387-420.

31. Star and Griesemer, 388-90. Clarke and Star provide a much more detailed framework for interacting social worlds in their 2007 publication: Adele E. Clarke and Susan Leigh Star, "The Social Worlds Framework: A Theory/Methods Package," *The Handbook of Science and Technology Studies* 3 (2008): 113-137.

32. Star and Griesemer, 390.

33. Star and Griesemer, 389.

The interpretive flexibility that Star and Griesemer associate with boundary objects is evident in EMS' development. This flexibility has allowed the many participants and stakeholders from the different social worlds in EMS systems to interact and function without necessitating consensus among them about the object. The collaborative work processes and efforts among the actors from differing social worlds translations from each to "allies," where the interplay results in passage points, makes myriad interpretations possible while maintaining the coherence of EMS as a boundary object.[34]

From the historic roots of American EMS system development, the work of its diverse stakeholders and its locally derived meanings are shared characteristics with the collaborative work among the actors in what Star and Griesemer identified as the boundary object that was the MVZ.[35] In both cases, EMS and the MVZ, collaborative work toward a common goal, among and between diverse people and groups, occurred without consensus about what the object was. Associates in EMS (the term EMS used here as a collective endeavor across multiple sectors) each have their own interpretations of what EMS is to them. They are personal and parochial, and derived through their work in EMS, and to each they are real.

This interpretive flexibility around EMS could be a source of strength in many ways if it indeed subscribes to Star's and Griesemer's model, allowing for EMS work to continue across different domains and actors, and to be adaptable to varying and changing local needs. Interpretive flexibility, however, is not necessarily beneficial in the domain of policy, and has potentially negative practical implications for national EMS and preparedness policy. Star employs the analogy of a microscope's field of view—as one focuses in closer, the images become clear, while a distance, they are fuzzy. EMS policy, and preparedness policy involving it, is fuzzy.[36]

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34. Star and Griesemer, 388-90.

35. Star and Griesemer, 392. See also Emergency Medical Services Systems Act, 5-7. The fifteen requirements for EMS systems in which reflect the diversity of stakeholders. See also the list of members of the National EMS Advisory Council, as an example. https://www.ems.gov/nemsac.html

36. Star and Griesemer, 413.

Star's and Griesemer's 1989 institutional analysis of the Berkeley Museum of Vertebrate Zoology has been foundational to what is a now a large body of literature about boundary objects across multiple disciplines and sectors. The concept originated as continuation of scholarly work on the social science *of* science. The work represented a departure from other contemporary social scientists, rejecting the assertion that for scientists to successfully cooperate, they had to be "funnels" of interpretive translation to and from the non-scientist to the scientist, and that consensus was necessary for successful scientific cooperation across communities of practice.[37]

In their analysis, Star and Griesemer identified two particular characteristics of the MVZ experience, and of collaborative scientific work in general, that made collaborative work possible across different social worlds: methods standardization, and boundary objects.[38] According to Star and Griesemer, the coherence of diverse perspectives and of the boundary object that results from the interplay of those operating at the intersection of different social worlds requires translations between the scientist and non-scientist, the entrepreneur and the funder, the curator and the field collector, and on.[39] These intersections can result in "trouble sharing knowledge in a way that leads to greater understanding."[40] It is the "tension between contexts that actually creates representation."[41] A boundary object emerging from this tension is a representation that

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37. Star and Griesemer, 389-91. The Callon-Latour-Law model to which Star and Griesemer refers is Actor-Network Theory (ANT). This theory has a large body of literature that has influenced science and technology. See: Michel Callon, "Some Elements of a Sociology of Translation," *The Politics of Interventions* (2007): 57-78; Michel Callon, and John Law, "On Interests and Their Transformation: Enrolment and Counter-Enrolment," *Social Studies of Science* 12, no. 4 (1982): 615-25; and Bruno Latour, "Give Me a Laboratory and I Will Raise the World," *Science Observed* (1983): 141-70, as examples of the formative works. For a concise overview of ANT, see Darryl Cressman, "A Brief Overview of Actor-Network Theory: Punctualization, Heterogeneous Engineering & Translation" (conference paper, Simon Fraser University, 2009), http://summit.sfu.ca/item/13593. The concept of communities of practice arose from the work of Lave and Wenger. See Jean Lave and Etienne Wenger, *Situated Learning: Legitimate Peripheral Participation* (Cambridge: Cambridge University Press, 2001).

38. Star and Griesemer, 388-90.

39. Star and Griesemer, 391-392

40. Beth A. Bechky, "Sharing Meaning Across Occupational Communities: The Transformation of Understanding on a Production Floor," *Organization Science* 14, no. 3 (2003): 312-330.

41. Geoffrey C. Bowker and Susan Leigh Star. *Sorting Things Out: Classification and Its Consequences*. Cambridge, MA: MIT Press, 1999.

can bridge the boundaries between different groups' knowledge, between producers and consumers or other "political, social or cultural figures or creeds."[42]

In Star's and Griesemer's study of the MVZ, they "identified two major factors contributing to the success of the museum: *methods standardization* and the development of *boundary objects*." [43] While they do not explicitly link the two as contingent, Star and Griesemer recognize the importance of "intimate connection between the management of scientific work as exemplified by these precise standards of collection, duration and description, and the content of the scientific claims made by Grinnell [the first director of the MVZ] and others at the museum."[44] The boundary object that was the MVZ, emerged from the cooperative work of the actors, and the success of both of Grinnell's rigorous guidelines for the collection and curation of samples for the museum, and of the boundary object in managing the diverse perspectives of the actors are analytical models for other cooperative efforts.

"A boundary object 'sits in the middle' of a group of actors with divergent viewpoints."[45] While the MVZ meant different things to each of its actors, they each represented "passage points" in the translations of shared meaning to and from their respective constituencies and others' through processes of working cooperatively.[46] As each group or individual work processes became passage points in success of the overall collaborative work, their resulting translations from "allies" built the coherence and the boundary object (see Figure 1). The resulting boundary object, in this case the MVZ, has a shared meaning among the stakeholders at the macro level—that is, the museum is a thing or "object," but at a more local level, it represents different things to each. The object itself

42. Nick J. Fox, "Boundary Objects, Social Meanings and the Success of New Technologies," *Sociology* 45, no. 1 (2011): 70–85. https://doi.org/10.1177/0038038510387196.

43. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 392-393.

44. Star and Griesemer, 393.

45. Star, "The Trojan Door," 406.

46. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 390.

served to support the collaboration of different communities operating around and within it.[47]

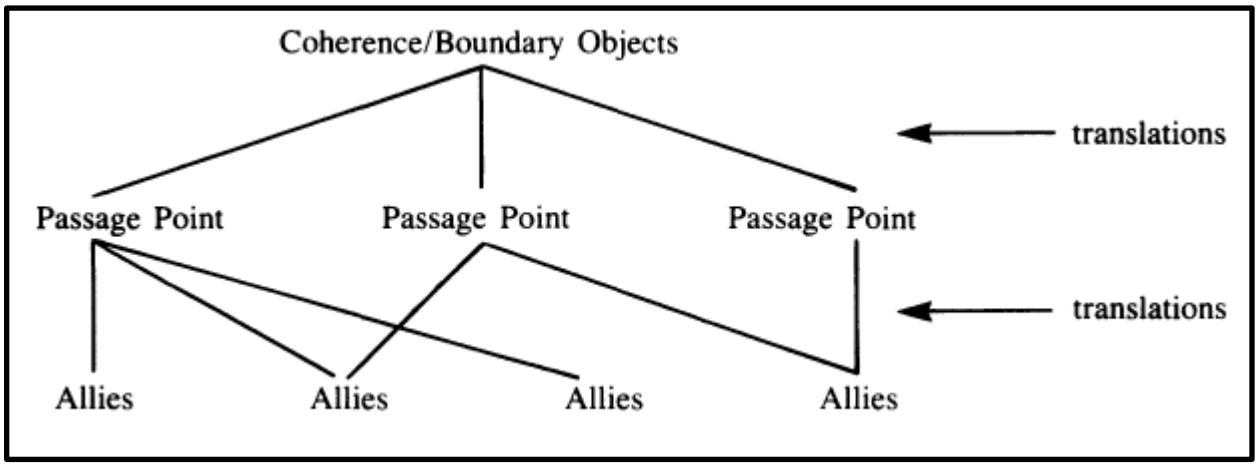

Figure 1. Many to Many Translation Mapping[48]

To the Berkeley University administration, the museum represented a means of acquiring philanthropic funding and a source of scientific prestige. To the curator, it represented a means of preserving information and facts about California's flora and fauna. To the trappers and collectors, the museum represented a source of income, and so on.

In Star's 2010 reflections on boundary objects, she summarizes her and Griesemer's initial concept of boundary objects from 1989 in this way:

- the object (remember, to read this as a set of work arrangements that are at once
- material and processual) resides between social worlds (or communities of
- practice) where it is ill structured.

47. Ernesto G. Arias and Gerhard Fischer, "Boundary Objects: Their Role in Articulating the Task at Hand and Making Information Relevant to It," *Intelligent Systems and Applications* (2000): 3, http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.26.1456.

48. Source: Star and Griesemer, 390.

- When necessary, the object is worked on by local groups who maintain its vaguer identity as a common object, while making it more specific, more tailored to local use within a social world, and therefore useful for work that is NOT interdisciplinary.

- Groups that are cooperating without consensus tack back-and-forth between both forms of the object.[49]

Consistent with these concepts, In the MVZ study, interdisciplinary collaboration required each actor to reconcile the shared form of the object with the form of the object that exists in his or her respective social world, to be able to cooperate with others working in the space, without requiring consensus among them. They then translated meaning from and to their respective constituencies across different dimensions, through their personalities and the processes of reconciling the meaning within communities of practice.[50] This included sharing "both domain-specific knowledge and common knowledge at a boundary."[51] Boundary objects provide multiple constituencies, each having different degrees of knowledge and control over the broader object with a tool to broker "translations, coordination and alignment…"[52] The broader MVZ object served to coordinate and share the diverse perspectives of the actors in the cooperative endeavor.

Since Star and Griesemer introduced the concept of the boundary object in their seminal work on the MVZ, a large and diverse body of literature on Boundary Object Theory has grown from it. The body of literature, as Star herself recognizes in her 2010 paper, emphasizes the interpretational flexibility that boundary objects represent, and the facility of collaboration that they afford, more than the "tacking back-and-forth" between interpretations, or translation.[53]

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49. Star, "This Is Not a Boundary Object," 604-05.

50. Dvora Yanow, "Translating Local Knowledge at Organizational Peripheries," *British Journal of Management* 15 (2004): S15.

51. Paul R. Carlile, "Transferring, Translating, and Transforming: An Integrative Framework for Managing Knowledge Across Boundaries," *Organization Science* 15, no. 5 (October 2004): 555–68.

52. Arias and Fischer, "Boundary Objects," 243–56.

53. Star, "This Is Not a Boundary Object," 605.

According to Star, in her 2010 reflections on over two decades of Boundary Object Theory, the early focus on interpretive flexibility potentially missed the mark in theoretical application.[54] Looking solely through the lens of interpretive flexibility, it is easy to see why Star herself was frequently asked questions like "Couldn't *anything* be a boundary object?."[55] If interpretive flexibility were the only necessary characteristic of boundary objects, it is possible that anything could be.

There is broad agreement in the literature, that boundary objects are beneficial as a means of collaboration with out consensus. There is also broad agreement that they are emergent phenomena that cannot be engineered, but rather arise out of the cooperative work through which they emerge. The shared meaning is a result of comparisons and interactions that result in a "mutually acceptable version" of the broader object, that is brought into existence through the action of cooperation.[56]

Researchers have applied the concept to the study of many different collaborative endeavors including distributed technological systems, design processes, manufacturing, medicine, education and curriculum design, and more.[57] In the public policy space, what would seem to be an obvious collaborative endeavor, boundary objects assist in both creation and implementation.[58]

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54. Star, "This Is Not a Boundary Object," 605.

55. Star, 604.

56. Jonas Landgren and Urban Nulden, "A Study of Emergency Response Work: Patterns of Mobile Phone Interaction," *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (ACM2007): 1323–32.

57. For examples of Boundary Object Theory in socio-technological systems, see Arias and Fischer, "Boundary Objects"; Souad Djelassi and Isabelle Decoopman, "Innovation through Interactive Crowdsourcing: The Role of Boundary Objects," *Recherche et Applications En Marketing* 31, no. 3 (September 2016): 131–52; F. Harvey and N. Chrisman, "Boundary Objects and the Social Construction of GIS Technology," *Environment and Planning A: Environment and Space* 30, no. 9 (September 1, 1998): 1683–94, https://doi.org/10.1068/a301683.

58. For public policy applications, see Robert Hoppe, "From 'Knowledge Use' towards 'Boundary Work': Sketch of an Emerging New Agenda for Inquiry into Science-Policy Interaction," *In Knowledge Democracy: Consequences for Science, Politics, and Media*, edited by Roeland J. in 't Veld, 169–86; Indira Banner, Jim Donnelly, and Jim Ryder, "Policy Networks and Boundary Objects: Enacting Curriculum Reform in the Absence of Consensus," *Journal of Curriculum Studies* 44, no. 5 (2012): 577–98. Cliff Oswick et al., "Codesigning as a Discursive Practice in Emergency Health Services," 73–91.

The literature generally views boundary objects as positive in cooperative endeavors, and there is far less literature on the potential negative *consequences* of boundary objects. Fox, in his study of the development of aseptic vs. antiseptic surgical techniques, discusses facilitative and inhibitory boundary objects through the historical case study of surgical sterile processes.[59] In his analysis, technological objects can act as boundary objects between two or more communities cooperating and sharing knowledge. However, he asserts that the objects may either be "facilitative or inhibitory of cross-boundary communication and innovation; and, most significantly, that the mode of function depends on the meanings that these objects encapsulate for the recipient community."[60]

In emergency medical services, the subject of my inquiry, there is scant application of Boundary Object Theory. There is a Danish study of participatory design, where an EMS *patient* acts as a boundary object, around which emergency services personnel coordinate response actions.[61] Similarly, Andersson, et al studied the use of boundary objects to facilitate cooperation between Swedish emergency response agencies in the management of accident scenes.[62] Their study, as with the majority of the entire body of literature, found boundary objects to be valuable in collaborative work. Other medical applications include studies of work processes, computer based medical records, and collaborative work.[63]

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59. Fox, "Boundary Objects," 70-85.

60. Fox, 80.

61. Margit Kristensen, Morten Kyng, and Leysia Palen, "Participatory Design in Emergency Medical Service: Designing for Future Practice," In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (ACM, 2006): 161–70.

62. Annika Andersson, Eric D. Carlstrom, Bengt Ahgren, and Johan M. Berlin, "Managing Boundaries at the Accident Scene – a Qualitative Study of Collaboration Exercises," *International Journal of Emergency Services* 3, no. 1 (2014): 77–94, https://doi.org/10.1108/IJES-02-2013-0003.

63. Xiaomu Zhou, Mark Ackerman, and Kai Zheng, "CPOE Workarounds, Boundary Objects, and Assemblages," In *Proceedings of the 2011 Annual Conference on Human Factors in Computing Systems - CHI '11* (ACM Press, 2011): 3353. Zhou et al studied computer-based physician ordering and the boundary objects resulting from medical care provider workarounds to avoid using the system. See also as an example, Marc Berg and Geoffrey Bowker, "The Multiple Bodies of the Medical Record," *The Sociological Quarterly* 38, no. 3 (1997): 513–37, in which the medical record is the boundary object, representing different things about a patient across communities of practice. See Frode Heldal, "Multidisciplinary Collaboration as a Loosely Coupled System: Integrating and Blocking Professional Boundaries with Objects," *Journal of Interprofessional Care* 24, no. 1 (2010): 19-30, for boundary objects in mitigating interdisciplinary medical conflict.

The scaling of local interpretations of EMS to the scale of public policy are not well studied. One analogous study looked a national educational curriculum in the United Kingdom as a boundary object in public policy implementation. In this study, Banner et al identified a national science curriculum as a boundary object, and the work of a policy implementation network in the absence of consensus about the interpretation of the curriculum, as a case study. The policy case study has some similarities to the implementation of the fifteen system requirements from the EMSSA, in that the implementation required cooperation among networks of actors, and that pressure toward standardization arose out of the need for accountability. In the curriculum case study, the educators were resistant to standardization because it reified their professional practices, and disrupted the cooperation within the implementation network by inserting oversight power dynamics based into the system to ensure accountability.[64]

In the EMSSA case, the law served as the boundary object around and within which the implementation network could operate. The analog to Grinnell's methods standardization in the MVZ case, were the requirements for federal funding outlined in the EMSSA. It named the Secretary of HEW as the oversight for the implementation, to ensure accountability. The cases depart in similarity there.

In the curriculum case, the educators' resistance to standardization was in protection of their community of practice and its professional practices.[65] In the EMSSA case, there was not an identified OHEMS community of practice in the EMS policy arena. There were thousands of local interpretations of EMS at very local levels, that represented communities of practice within organizations, but not one that corresponded with the policy level of scale.

The emergence of this community of practice, the modern OHEMS community of practice, came about later, *after* the policy had been implemented and after some of these thousands of interpretations were reconciled through subsequent policies and the work of millions of EMS calls for service. In Banner's study, the education communities of

64. Banner, Donnelly, and Ryder, "Policy Networks and Boundary Objects," 577–98.

65. Banner, Donnelly, and Ryder, 593-94.

practice, both at local and in her case, national levels of scale, were well established prior to the policy implementation.

In scaling of boundary objects, Clarke and Star describe the interplay between social worlds as "intersections" between shared "substantive/topical interests and commitments," and when the numbers of these intersections result in conflicts among "different sorts of careers, viewpoints, funding sources, and so on, the whole is analyzed as an arena," which Clarke and Star define as "multiple worlds organized ecologically around issues of mutual concern and commitment to action."[66] EMS interpretation, and the resulting boundary object it represents at varying levels scale, arise from the activities within the respective arenas in which they develop, and provide a venue for "co-creating common ground."[67]

While EMS certainly represents the interpretive flexibility among actors that the MVZ did, since the repeal of the EMSSA, it lacks the methods standardization that the authors ascribe to Grinnell's success in managing diverse views. Medical protocols are highly localized, based often on physician medical director preferences, and do not necessarily reflect best medical practices.[68] EMS system models reflect local choices and resources, and are different across the country. EMS models include public and private, volunteer and professional, and law-enforcement, fire service, hospital, public health and stand-alone "third-service" models.[69] In the MVZ example, methods standardization was part of the expected rules for participation in the object. While there are varying opinions about the relative virtues of various models, there is little evidence to support any particular one.[70]

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66. Clarke and Star, "The Social Worlds Framework," 113.

67. Bechky, "Sharing Meaning Across Occupational Communities," 314.

68. Smith, "Utilizing Control in Emergency Medical Services," 147.

69. Institute of Medicine, *Emergency Medical Services: At the Crossroads* (Washington, DC: The National Academies Press, 2007), 2.

70. Institute of Medicine.

3. Communities of Practice

The Boundary Object Theory body of literature is closely tied and often intertwined with those of organizational knowledge, situated learning, and communities of practice.[71] The close connection led to additional research questions—"Is the Denver Paramedic Division a community of practice," and "Is OHEMS a community of practice?" The communities of practice body of literature is largely concerned with organizational learning, beginning with Lave and Wenger's seminal work.[72] The community of practice, which I hypothesize exists both within the Denver Paramedic Division, and in OHEMS more broadly, results from situated knowledge that arises from doing the work.

Lave and Wenger define a community of practice as "a system of relationships between people, activities, and the world; developing with time, and in relation to other tangential and overlapping communities of practice."[73] The body of knowledge in the communities of practice literature emerged from the study of learning by doing, and its connection with Boundary Object Theory and communities of practice is logical.

Communities of practice are emergent phenomena, like boundary objects, that "grow out of a convergent interplay of competence and experience that involves mutual engagement."[74] They are social learning systems that result from different modes of social belonging, which Wenger describes as engagement, imagination, and alignment—engaging with each other and the world, imagining a construction of ourselves and our world, and "making sure that our local activities are sufficiently aligned with other processes so that they can be effective beyond our own engagement."[75] These social learning systems produce situated knowledge—"learning-in-working," similar to the meaning-in-working that boundary objects represent.[76]

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71. Lave and Wenger, *Situated Learning.* Lave and Wenger introduced the concept of communities of practice, which has inspired a large body of literature subsequently.

72. Lave and Wenger.

73. Lave and Wenger, 98.

74. Wenger, "Communities of Practice and Social Learning Systems," 229.

75. Wenger, 227-28.

76. Brown and Duguid, "Organizational Learning and Communities of Practice," 100.

Carlile, in his 3-T integrative framework for managing knowledge across boundaries, identifies the three "Ts" for managing organizational knowledge—Transferring, Translating, and Transforming (see Figure 3).[77] The framework is useful in understanding what occurs in Star and Griesemer's model of many to many translations between actors in the cooperative endeavor of a boundary object (Figure 1), as well as the fundamental elements of a community of practice in Wenger's model.[78]

Do communities of practice act as the "translators" at different levels of analytical scale with boundary objects? How do these groups help create shared meaning of what EMS is and does? The answers to these questions may elucidate how domain-specific knowledge in OHEMS develops and is translated to and among other actors. This knowledge has the potential to inform policy at multiple levels, to define a domain and to move OHEMS toward being considered a recognized discipline.

77. Carlile, "Transferring, Translating, and Transforming," 555–68.

78. Star and Griesemer, "Institutional Ecology, `Translations' and Boundary Objects," 390.

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II. IS EMS A BOUNDARY OBJECT?

The term "emergency medical services" is vague and encompassing. Even the term EMS itself reflects multiple meanings. Is it singular or plural? Grammatically, it is plural, as the "S" stands for "services." Depending on the interpretation, however, the term EMS can represent one agency that supplies services, can represent a field of study, can represent a function or capability, or a public service. The difficulty defining it, certainly makes aligning policy across multiple levels a complex challenge.

According to the United States Department of Transportation's National Highway Traffic Safety Administrations' Office of EMS, "EMS is a *system* of people and agencies working cooperatively to provide emergency medical care."[79] Actors in EMS are diverse and include communications personnel, paramedics and emergency medical technicians (EMTs), emergency medical nurses, physicians and others.[80]

The public often associates EMS with ambulances. As a component of the emergency response community, just as police *cars* and fire *trucks* are commonly associated with those emergency services, this is not surprising. However, in the fire service and law enforcement, the vehicle does not define the discipline. Bucket brigades and beat cops existed long before the modern fire pumpers, ladder trucks and police cruisers that we see today. The link between EMS and ambulances, however, seems much more inextricable. Is this a result of its historic development?

EMS, as an endeavor, relies on the interwork of notification systems, response systems, medical care systems, public health systems and transportation systems, and as such, is a complex endeavor. EMS *systems*, are systems of systems, comprised of collaborative efforts of people and agencies across multiple sectors.[81] While often involving vehicles, like ambulances and helicopters, contemporary EMS systems typically involve more than a transport service to other medical systems.

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79. "What Is EMS?" EMS. Accessed August 7, 2018. https://www.ems.gov/whatisems.html.

80. EMS.

81. DeLaurentis and Callaway, "A System-of-Systems Perspective," 829–30.

There is an old adage in the emergency medical services community—"If you've seen one EMS system, you've seen one EMS system." This is rooted in reality. Emergency medical services systems in the United States began to formalize in the mid to late 1960s, and reflect the efforts of local entrepreneurs operating with local resources to meet local preferences and expectations, particularly after the effective repeal of the EMSSA and its methods standardization. While there are common elements, understandings and expectations about what EMS is and does, each community's EMS system is somewhat unique.

EMS has diverse stakeholders. As an emergency service in most communities, stakeholders typically include elected officials, governmental entities, and regulatory bodies; other members of and partners in the emergency response community, including those in the 911 communications sector, law enforcement, firefighting and the military, among others, both as response partners and potential recipients of EMS services.

As a medical service, EMS has stakeholders in the medical community, the public health community, and hospital and trauma systems, among others. In the nation's fee for service payment model for medical care, EMS also has stakeholders in the insurance industry, governmental payers and associated regulatory bodies. In the federal government, over thirty federal departments and agencies have some connection to EMS, either through connections to EMS policy, payment, regulation or direct provision of EMS services.

These partners translate their perceptions of the endeavor to their constituencies and allies, giving these interpretations local meaning that may or may not be different from the meaning of the EMS within the EMS arena.[82] There does not have to be consensus about what the endeavor of the arena is, as each constituent group has local meanings, and the shared meaning as an endeavor creates enough coherence to facilitate cooperation.[83]

82. Star and Griesemer, "Translations and Boundary Objects," 411-12. This describes the "tacking back-and-forth" between the local and global interpretations of the object, upon which Star expounds in her 2010 work.

83. Star and Griesemer, 389-390.

The coherence of the EMS boundary object is dependent on the "*n*-way" translation of the object to the respective allies of each actor.[84]

The ability for such broad and diverse groups of stakeholders to work in the EMS space without rigid definitions of what EMS is and what it can, does or should do, is a potential benefit of its boundary object status. It provides an object for targeted cooperative work across different communities of practice and disciplines.[85] The majority of the stakeholders in EMS are aligned in disciplines with clear organizational and disciplinary domains and venues for their respective practices. However, those practicing the *discipline* of out of hospital emergency medical care (OHEMS), inasmuch as one exists, suffer from the ambiguity that the term "EMS" represents.

OHEMS care, also referred to as "prehospital care," refers to the care provided by EMS providers in "the field." The "field" is broadly inclusive of any care rendered outside of the walls of a care facility. I will be addressing only the civilian out of hospital care in the United States, as the military has difference policy issues with out of hospital EMS care and specific definitions of levels of care and their respective venues. "Prehospital" is a ubiquitous term for the people and care provided in the field in the medical community of practice. The term "prehospital" implies a continuation of the OHEMS care to occur in a hospital, insinuating and reinforcing the transportation focus of the OHEMS personnel.

Modern OHEMS, however, includes care to *preclude* transport to hospitals, or even elements of home health care and "house call" patient assessments to keep patients *out* of hospitals, as in community paramedic programs, which can include "providing telephone advice to 9-1-1 callers instead of resource dispatch; providing community paramedicine care, chronic disease management, preventive care or post-discharge follow-up visits; or transport or referral to a broad spectrum of appropriate care, not limited to hospital

84. Star and Griesemer.

85. Lave and Wenger, *Situated Learning.* Lave and Wenger introduced the concept of communities of practice, which has inspired a large body of literature subsequently.

emergency departments."[86] Perhaps one of the most important roles EMS plays is determining *who* is a patient. If OHEMS practitioners transported everyone they encountered to receiving hospitals, the entire medical system, taxed on a daily basis, would be far worse off. This important capability is not acknowledged in federal doctrine. The evolution of EMS systems from transportation to medical care reflects its history, and its future.

86. Bryan Y. Choi, Charles Blumberg, and Kenneth Williams, "Mobile Integrated Health Care and Community Paramedicine: An Emerging Emergency Medical Services Concept," *Annals of Emergency Medicine* 67, no. 3 (March 2016): 361–66. https://doi.org/10.1016/j.annemergmed.2015.06.005. Multiple EMS stakeholder groups have collaborated to try to define community paramedicine (also referred to as mobile integrated health, and likely another boundary object). Many of them collaborated on a vision statement that can be found at: http://www.naemsp.org/Documents/PRESS%20RELEASE%20NAEMT-Vision-News%2002-06-14.pdf, and at many of the other organizations' websites.

III. LOCALLY DERIVED MEANING

EMS is a collaborative work endeavor. Cooperating paramedics, nurses, physicians, helicopter pilots, and many others, translate their perceptions of the endeavor from their constituencies and allies, giving these interpretations local meaning (what they and their colleagues do that is EMS) that is different from the meaning of the broader endeavor (what EMS is).[87] To each, and the communities and perceptions of EMS they represent, the EMS arena is a coherent enough object in which they can cooperate. At all levels of inquiry, the interpretive flexibility about EMS and the translations of what EMS is, from and to its multiple constituencies, and the collaborative work from which EMS results is what Star and Griesemer consider a "boundary object."[88]

Boundary objects are beneficial for allowing such broad and diverse groups of stakeholders to work in the EMS space without rigid definitions of what EMS is and what is can, does or should do, particularly at the organizational and more local levels of scale.[89] It provides an object for targeted cooperative work. However, the discipline of OHEMS, inasmuch as one exists, suffers from this ambiguity. Multiple perspectives surrounding OHEMS, and translations of them to stakeholder constituencies, has impacted and continues to impact its development as a discipline, and hinders the development of coherent preparedness policy.

Unlike other public services, EMS is not generally considered a public good. Economists define public goods as goods and services provided to all members of the public, without profit, by governments or private institutions, that benefits all and does not have a marginal cost to provide to additional people.[90] Because there not a single model,

87. Star and Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects," 390-91.

88. Star and Griesemer, 392.

89. Star, "This is Not a Boundary Object," 12.

90. Paul M. Johnson, "Public Goods: A Glossary of Political Economy Terms," Auburn University, https://www.auburn.edu/~johnspm/gloss/public_goods; Van Milligan et al., *An Analysis of Prehospital Emergency Medical Services as an Essential Service and as a Public Good in Economic Theory,* Report No. DOT HS 811 999a (Washington, DC: National Highway Traffic Safety Administration, 2014), 2.

and "EMS can be delivered by either paid or volunteer personnel at a stand-alone local government EMS agency, fire department, hospital, for profit or non-profit private company, or by other less common ways, such as a police department or an integrated public safety department," EMS does not meet the economic definition of a public good, but rather is more of a common good—"a good where it is difficult or impossible to exclude users from the benefit, but where there is a marginal cost to provide the benefit to additional individuals."[91] While consistent with our system of federalism and the economic principle of local choice, there is no national policy requiring the delivery of EMS services.[92] This is not to say that it does not exist in most communities, but rather that EMS boundary objects reflect highly local perceptions.

According to a report commissioned by the National Highway Transportation Safety Administration (NHTSA), the U.S. federal agency that has provided the most support for EMS in the past thirty plus years, depending on state governmental structures, states may or may not require their political subdivisions to provide EMS in their jurisdictions.[93] Only North Carolina, California, Oregon, and Colorado, have taken steps to ensure EMS delivery.[94] Even these policy efforts, however, are weakly worded and speak more to the classification of EMS providers as "essential personnel," than they do to require the delivery of services these "essential personnel" provide.[95]

Modern EMS systems are complex systems of systems, including technological systems, communications systems, transportation systems, medical systems and more, comprised of collaborative efforts of people and agencies across multiple sectors.[96] Each of these component systems may be a boundary object in itself, viewed through the "local"

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91. M. Van Milligan, et al.

92. Charles M. Tiebout, "A Pure Theory of Local Expenditures," *The Journal of Political Economy* (1956): 416-424.

93. Van Milligan et al. An Analysis of Prehospital Emergency Medical Services, 7.

94. Van Milligan et al., 11.

95. Van Milligan et al., 6-7.

96. DeLaurentis and Callaway, "A System-of-Systems Perspective"; Smith, "Utilizing Control in Emergency Medical Services," 3.

eyes. Each may have its own meaning in the context of the collaborative work of EMS. The interplay of the people and systems in which they operate contribute to the broader object in and with which they are working.

I have tried throughout my career to uphold the public's trust that they will have reliable, timely, compassionate, state of the art medical care when they are injured or ill, delivered by conscientious EMS providers (my own translation of meaning). Unfortunately, I am often left asking why people are satisfied with less than this for themselves, their friends and families, and their children. Perhaps Bowker and Star have recognized the issue. The public lack a comparative perspective—"People often cannot see what they take for granted until they encounter someone who does not take it for granted."[97] In my experience, people do not think critically about EMS systems. When they need them, they have neither the time nor the inclination to conduct any evaluation. I fundamentally believe the public trusts us to provide the best care available, quickly and compassionately.

The public's trust goes beyond the individual, episodic interactions with EMS. Should the public want to evaluate EMS or compare service across systems and jurisdictions, there are few medical benchmarks for meaningful comparison, particularly in the clinical medical practice realm. The scantiness of meaningful out of hospital EMS research and longitudinal medical outcomes research is a great barrier to implementing EMS clinical medical and healthcare policy and leaves the public in the unenviable position of trusting blindly that its members are getting the best care every time.[98] Unfortunately, whether they know it or not as individuals, as citizens, as patients or potential EMS consumer, this is often not the case. Or that, equally disturbing, we do not know what optimal care *is*. According to the Institute of Medicine, "Very little is known about the

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97. Bowker and Star. *Sorting Things Out,* 290-91.

98. Smith, "Utilizing Control in Emergency Medical Services," 6. The lack of prehospital research is common knowledge in the emergency medical community. See, e.g., National Highway Traffic Safety Administration, "EMS Agenda for the Future" (Washington, DC: National Highway Traffic Safety Administration, 1996); Institute of Medicine, *Emergency Medical Services,* National Academies of Sciences, Engineering, and Medicine. *A National Trauma Care System: Integrating Military and Civilian Trauma Systems to Achieve Zero Preventable Deaths after Injury* (Washington, DC: National Academies Press, 2016), pp. 5-26.

quality of care delivered by EMS. The reason for this lack of knowledge is that there are no nationally agreed-upon measures of EMS quality and virtually no accountability for the performance of EMS systems."[99]

Outside of a narrow slice of EMS call types, it is difficult to say that anything EMS does matters from a patient outcomes perspective.[100] In my EMS translation, one of the most compelling statements I have ever heard about emergency medical care in America is, "Where you live, should not determine *if* you live."[101] Unfortunately, however, it does, which I have found quite unsatisfying, considering I have dedicated my entire adult life to providing EMS.[102] I do not, however, delude myself that people are necessarily rational about their EMS system "choices," particularly because their local EMS system is not likely a priority in their selection of a community in which to live. This, however, makes upholding their trust that much more important to me.

There is wide variation in survival from out of hospital cardiac arrest (OHCA) between communities. Strangely, this documented disparity has not led to the critical public analyses and problem solving like those around roadway trauma that shaped EMS in its infancy. Why is this? Creating broad EMS policy is daunting, considering the limited ability to compare EMS effectiveness across communities, or more fundamentally, even define it. EMS actors' locally derived and strongly held perspectives and preferences and

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99. Institute of Medicine, Emergency Medical Services, 3.

100. M. A. Krousel-Wood, "Practical Considerations in the Measurement of Outcomes in Healthcare," *The Ochsner Journal* 1.4 (1999), 187. Patient outcomes are generally accepted to be measures of the end result of healthcare encounters. This assumes that EMS provides healthcare.

101. National Academies of Sciences, Engineering, and Medicine. *A National Trauma Care System.* It is difficult to attribute this quote to any particular individual. I first heard it spoken by Denver Health CEO Patricia Gabow, in the late 1990s and it has stuck with me since. I have repeated this in various forums throughout my professional career, attributing it to her. Most recently, I shared it with my committee mates on the National Academies of Science, Engineering and Medicine's Committee on Military Trauma Care's Learning Health System and its Translation to the Civilian Sector, and it can be found in the report.

102. Erik P. Hess, and Roger D. White, "Optimizing Survival from Out-of-Hospital Cardiac Arrest," *Journal of Cardiovascular Electrophysiology* 21, no. 5 (2010). Another source of comparative data is CARES, https://mycares.net/. CARES is a database of standardized comparative criteria for survival from out of hospital cardiac arrest. It is one of few standardized measurement tools to compare the relative effectiveness of EMS in one patient call type. The data from CARES demonstrate differences in community survival rates as well. Another example may be found in Richard P. Gonzalez et al., "Does Increased Emergency Medical Services Prehospital Time Affect Patient Mortality in Rural Motor Vehicle Crashes? A Statewide Analysis," *The American Journal of Surgery* 197, no. 1 (January 2009): 30–34.

the public's blind trust rarely combine to create the critical mass necessary to drive broad EMS policy creation or quality improvement.

Among the policy challenges in EMS are reconciling ill-defined scope and function, differences in meaning between and among stakeholders and the local perceptions about EMS, which reflect local public choices, informed or uninformed.[103] Many members of the public equate EMS with an ambulance, its practitioners consider themselves skilled medical providers with capabilities beyond the transportation of patients, and governmental and operational partners in the emergency services sector (ESS) view EMS as an emergency response resource and medical support for the other elements of the ESS.[104]

Emergency medical physicians, nurses and trauma services personnel view EMS as partners and a means of patient arrival to them. Elected officials consider EMS among the array of public services their constituencies expect, and for which they must plan. Members of the public health community view EMS as a mobile, 24/7 resource for various activities and a source of population health data. Interestingly, they are all correct and their diverse perceptions and definitions do not preclude meaningful interaction between and among them.[105]

Operationally, EMS capabilities and benchmarks are also widely variable depending on local resources, personnel, training and equipment.[106] Some EMS standards do exist. The operational performance and deployment standards reflect parochial rather than evidence-based standards for the numbers of personnel and levels of care they should provide, and reductionism in their time-based response targets. The time-based standards are based on metrics for achieving particular sub-goals for the aggregate time-based

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103. Star and Griesemer, "Translations and Boundary Objects," 390.

104. "Emergency Services Sector Resources," Department of Homeland Security. Accessed July 9, 2015. http://www.dhs.gov/emergency-services-sector-resources.

105. Star and Griesemer, "Translations and Boundary Objects," 388.

106. Smith, "Utilizing Control in Emergency Medical Services," 13.

process goals and are based on parochial interests and limited research.[107] The standards are "consensus" standards, but without a research base from which to draw, or meaningful benchmarks to make good policy in the EMS space, EMS system caretakers and stakeholders are left with time as one of the only measures of EMS system effectiveness or quality. Clinically, however, time does not equal quality outside of a narrow set of circumstances.[108]

The public perception of time as important is part of the coherent boundary object, and reflects one of the public's expectations and one of its most important evaluative criteria. Response time, as a surrogate for quality, may satisfy the public in the boundary object perception that EMS *responds*, but my decades of dealing with the public's definitions of successful response for decades in the EMS system in Denver, support my assertion that the public does not know what it does not know beyond that, other than they expect compassion. While EMS systems typically have voluminous *information* on which to base analyses—CAD data, patient care data and other process data, the public requests for the information, and analyses using it, do not occur. I could distill public expectations down to "fast and nice."

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107. "NFPA 1710: Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments," National Fire Protection Association, accessed August 7, 2018, https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1710. NFPA 1710 is a standard promulgated by the National Fire Protection Association for career (paid) fire departments. The "standard" is often applied to EMS systems of all configurations, in the absence of other EMS deployment standards. It uses increments of time as the standard for activities governed by the standard. Other standards include American Society for Testing and Materials. ASTM, *Standard Guide for Organization and Operation of Emergency Medical Services Systems*, F1339-92(2016) (West Conshohocken, PA: ASTM International, 2016), www.astm.org. This particular standard addresses global EMS system organization, but there are many other ASTM standards that address EMS related topics from equipment to personnel. As with many consensus standards, they are voluntary unless adopted through legislation as standards. Mickey Eisenberg, Lawrence Bergner, and Alfred Hallstrom, "Paramedic Programs and Out-of-Hospital Cardiac Arrest: I. Factors Associated with Successful Resuscitation," *American Journal of Public Health* 69, no. 1 (1979): 30-38. This seminal study was the first to punctuate the importance of response times. It is based on cardiac arrest survival, a very small fraction of the calls to which EMS agencies respond nationally. Most EMS systems nationally have time-based response time goals, based on this research, which are the primary performance metrics.

108. Peter T. Pons, Jason S. Haukoos, Whitney Bludworth, Thomas Cribley, Kathryn A. Pons, andVincent J. Markovchick, "Paramedic Response Time: Does It Affect Patient Survival?" *Academic Emergency Medicine* 12, no. 7 (2005): 594-600.

A different translation of EMS, as medical care, would have other criteria for evaluation, and would subject the services to the lacking academic inquiry into the medical quality, including outcomes measures. The reality, however, is that Americans trust that they are protected by competent, high-performing EMS systems that will provide them with the highest quality care during times of need, but "has no idea whether this is true, and no way to know."[109]

Tiebout, in his pure theory of local expenditures, proposed that each community, based on the assumptions that governments understand the unique needs of their populations, tax people accordingly to provide public services.[110] The theory assumes that people have clear understanding of the tax structures of the communities in which they *choose* to live, and that they have unrestricted movement to choose other communities that better suit their needs. While not *required* in every community, or always provided by governments, some semblance of EMS is typically among the services in most communities.

Because it is not always provided by government, EMS in America is not always a public good as defined in economic terms. How citizens in Tiebout's model decide what level of EMS service is appropriate, reflects the negotiated boundary object at the local level. Assuming free movement between communities in the theoretical model, and the absence of robust comparative information, how do citizens determine what level of performance they should expect, particularly since they may not have been a part of the work resulting in the boundary object? How do they, members of multiple communities of practice, contribute a translation to the object? Are the objects (EMS systems) still plastic?

As a boundary object, what EMS is and does reflects its translation. It is evident across the literature and in the groups claiming the EMS moniker, as well as having distributed geographic meanings. There are numerous groups who have an EMS focus, to

109. Institute of Medicine, *Emergency Medical Services,* 4.

110. Tiebout, "A Pure Theory of Local Expenditures," 416-424.

include professional associations, labor groups, and publications.[111] State governments all have an EMS office to serve as a regulatory body for the licensure and practice of EMS within each.[112] The translated definitions of EMS seem to fall within the public safety, public health, or medical realms, depending on the entity making the definition, and the practice or component practice being evaluated.

The EMS practiced outside of the walls of clinical facilities, in urban environments to ultra-rural and austere environments, is a clinical medical discipline, as one can derive from the national standard curricula for paramedics and EMTs. The curricula have requirements for medical training and education, but very little about vehicle operations, scene dynamics and management, personal safety or defense- daily parts of OHEMS practice. These represent what Brown and Duguid call "noncanonical" practices that are typically learned by doing with other members of a community of practice.[113] The gaps represent part of OHEMS' evolution from a primarily transportation-based endeavor to a more clinical emergency response and public safety-oriented one, while maintaining its transportation duties. It reflects a change in the broader "translation"[114] of what EMS is, which could arise from stronger voices among the collaborators, the conflict between academic and tacit knowledge, deferment to "expert" opinion, or other causes that this thesis will not address, but are areas for further research.

From a healthcare perspective, the clinical medical care OHEMS provides falls on a continuum. A search for EMS research will produce links to mostly retrospective medical clinical studies on myriad topics, with cardiac arrest resuscitation being among the most prevalent. As a scientific discipline, medicine has a robust, evolving body of knowledge,

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111. For an example, although incomplete list of EMS groups and organizations, see National Association of Emergency Medical Technicians, "Other Organizations," Accessed July 12, 2015. https://www.naemt.org/advocacy/otherorganizations.aspx.

112. "About," The National Association of State EMS Officials. Accessed September 9, 2018. http://www.nasemso.org/About/StateEMSAgencies/StateEMSAgencyListing.asp.

113. Brown and Duguid, "Organizational Learning and Communities of Practice," 103-04. Brown and Duguid initially published the work in 1991, and a reprint in 2000 with the same title in a different publication. The two are slightly different and the reference from the material will include the year of the work cited.

114. Star and Griesemer, "Institutional Ecology, `Translations' and Boundary Objects," 390-391.

and most of the research in EMS is clinical. Literature on EMS in general, is largely conducted and published by physician and academic researchers using EMS data. EMS journals are a potpourri of operational and clinical best practices, organizational leadership and business practices. The National EMS Assessment asserts that "The ingredients for success within EMS lie in the understanding of the health and medical care of populations through patient-centered systems of care. Emergency Medical Services might be more functionally termed Emergency Medical Systems."[115] This interpretation of the EMS object is expansive and inclusive, but not the dominant one at this point in history.

DeLaurentis and Calloway have studied the challenges of policy decision making for system of systems (SOSs), and describe them as "generally have the following distinguishing traits: physically distributed systems, prime dependency of overall functionality on linkages between distributed systems, and system heterogeneity, especially the inclusion of sentient systems, for example, thinking and evolving individuals or organizations."[116] Because an EMS *system* is a SOS, with OHEMS being but one system among them, it is difficult to determine its relative preparedness or effectiveness in isolation.

These are certainly traits found in EMS, with geographically distributed systems whose function is dependent on multiple linkages to include transportation systems, communications systems, the other components of the EMS system (i.e. hospitals, operating rooms, emergency departments, etc.), among others, and thinking and evolving people and practices. This interconnectedness may make EMS systems subject to what Perrow terms "normal accidents."[117] Schooley and Horan et al describe the difficulty in evaluating the performance of EMS from "end to end" based on operational, organizational, and governance dimensions of interorganizational time-critical services,

115. EMS, "FICEMS."

116. DeLaurentis and Callaway, "A System-of-Systems Perspective for Public Policy Decisions," 831.

117. Perrow, Charles. Normal Accidents: Living with High-Risk Technologies. New York: Basic Books, 1984.

using information integration as a challenge.[118] This is not, however, the only challenge in a complex SOS.

118. Schooley, Ben L., and Thomas A. Horan, "Towards End-to-End Government Performance Management: Case Study of Interorganizational Information Integration in Emergency Medical Services (EMS)," Government Information Quarterly, Interorganizational Information Integration: A Key Enabler for Digital Government, 24, no. 4 (October 2007): 755–84.

IV. THE DENVER PARAMEDIC DIVISION

> "If social scientists do not understand people's definition of a situation, they do not understand it at all."[119]
>
> —Geoffrey Bowker and Susan Leigh Star

A. MISSION

The Denver Paramedic Division is a governmental entity and division of the Denver Health and Hospital Authority (DHHA). Colorado Revised Statutes § 25-29-101, et seq. established DHHA as a corporate body and a political subdivision of the State of Colorado in 1997.[120] Prior to this, the components of today's DHHA, including the Paramedic Division, were part of the Denver Department of Health and Hospitals, a city department funded out of the city's general fund. The creation of DHHA entailed the transfer of most of the health and medical infrastructure and programs from the City and County of Denver, including the Paramedic Division.[121]

The Denver Paramedic Division ("The Division") is the sole 911 service provider to the City and County of Denver (CO), and the communities of Glendale, Sheridan, Englewood, and the Skyline Fire Protection District in neighboring Arapahoe County.[122] It is a core service of DHHA's vertically integrated health system, providing an array of health and medical services to the City and County of Denver, Colorado, as well as to the Rocky Mountain Region (Figure 2).

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119. Bowker and Star. *Sorting Things Out,* 289.

120. "Then and Now: Ambulances," Denver Health. Accessed August 8, 2018. https://www.denverhealth.org/blog/2017/11/then-and-now-ambulances. The first documented ambulance transport in Denver was in 1861, using a horse drawn ambulance, and there has been ambulance service in Denver ever since. The ambulance service, affiliated with Denver General Hospital, was part of Denver's services to its citizens and visitors since before Colorado was even a state. The vehicles, the people and the level of care have evolved dramatically over time, but ambulances still respond to calls for assistance in Denver as part of a progressive emergency services system.

121. "About Us," Denver Health," Accessed August 4, 2018. https://www.denverhealth.org/about-denver-health.

122. "Home," Accessed August 4, 2018. https://www.denverhealthparamedics.org/

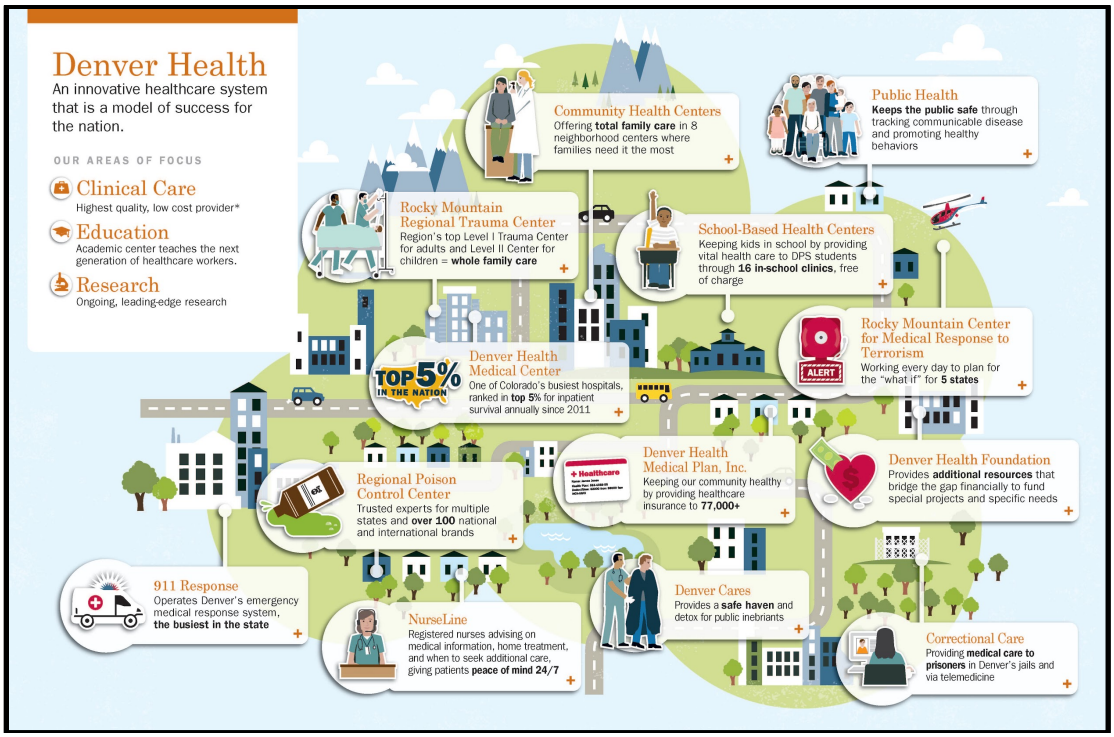

Figure 2. Denver Health Services[123]

The Division operates and oversees the 911 EMS system, from the initiation of calls in the combined communications center at Denver 911, through emergency ambulance response and patient transport to ten receiving facilities' emergency departments and one freestanding emergency room. The system has a single medical director, an emergency medicine residency-trained physician who provides the medical policy oversight over Denver 911, the Denver Fire Department, the Denver Police Department, and the Paramedic Division. The City and County of Denver's Department of Public Safety convenes a monthly Emergency Medical Response System (EMRS) committee meeting to maintain global awareness, performance metrics promulgation and monitoring, and collaboration across the agencies of the system.

The EMS system is a two-tiered system, with basic life support (BLS) emergency response provided by the emergency medical technicians (EMTs) of the Denver Fire Department, and the Paramedic Division provides advanced life support (ALS) and

123. Source: Denver Health, "About Us,"

transport. It is the lead agency for the emergency medical response and is the medical authority in the out of hospital setting. The Division works closely with the other emergency response agencies to manage all emergencies in Denver, from the routine to disasters and mass casualty incidents.

The EMRS agencies are co-located in the Denver 911 combined communications center, and operate on a shared computer aided dispatch (CAD) system where all agencies see the same call information in real time. The Paramedic Division has its own personnel, as does Denver Fire, in the combined center to manage its resources, dispatching them over 800 MHz radios. Denver Police are dispatched by civilian personnel, employees of Denver 911.

The Division is subdivided into functional operational areas overseen by assistant chiefs. These subdivisions include 911 operations, Denver International Airport operations, training and education, administration, and preparedness and logistics. The Division is the connector between the field and the emergency department at Denver Health Medical Center (DHMC), where medical direction for the system resides, providing early notification of mass casualties, and coordination with the emergency medicine and trauma system. It also provides regional situation awareness to other regional hospitals and receiving facilities and serves as the emergency caretaker of the regional hospital system by ensuring the equitable distribution of patients across the region in mass casualty incidents.

Aside from the day-to-day 911 EMS duties, the Paramedic Division is involved in the City and County of Denver's planning and preparedness activities, and has a robust coordination role for the public health and medical systems, at both the operational and strategic levels. Trained representatives serve as EMS Branch Directors in the city's emergency operations center (EOC) when it is activated, and participate in the city's Local Emergency Planning Committee (LEPC), in its Emergency Planning Committee in the Office of Emergency Management and Homeland Security (OEM/HS), among others.[124]

124. "Local Emergency Planning Committees," EPA, accessed August 5, 2018. https://www.epa.gov/epcra/local-emergency-planning-committees.

The Paramedic Division has taken on a leadership role in the ten county NCR, establishing and chairing a regional EMS committee focused on EMS all-hazards preparedness, and developing policy and grant projects for growing and supporting locally identified EMS capabilities. The committee represents EMS as a functional discipline across multiple other operational and preparedness sectors, in homeland security and healthcare preparedness groups in the region, corresponding to state and federal grant funding streams.[125] The Paramedic Division's role as an entrepreneur in the region has shaped the boundary object of EMS at regional and statewide levels of scale through these activities.

From a regional, state and federal perspective, the Division is the statewide emerging pathogens transport agency, moving patients with highly infectious diseases like Ebola Virus Disease (EVD) from across the state to DHMC or another designated treatment facility. It coordinates statewide mobilization of the Strategic National Stockpile CHEMPACK assets, as well, and is also the transport coordinator for the National Disaster Medical System (NDMS) for patient movement into or out of Denver International Airport when NDMS is activated.[126] The Paramedic Division, among the partners in each of these respective endeavors, has a different meaning to each. Its responsibilities as an EMS agency, particularly in the area of preparedness are not necessarily the same as other agencies, reflecting its historically derived and iteratively renegotiated meaning, which came from the efforts of its members and others working together.

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125. The regional EMS committee is a subcommittee under the Colorado North Central All-Hazards region, the fiscal agent for Colorado's State Homeland Security Grants Program (SHSGP), but serves as a single point of EMS representation in multiple preparedness venues, including the Denver Urban Area Security Initiative (UASI), the Metro/Foothills Healthcare coalition, the ten-county Colorado North Central Healthcare Coalition, and both the Mile High and Foothills Regional Emergency medical and Trauma services Advisory Councils' (RETAC) Mass Casualty Incident (MCI) Planning Committees. The committee represents nearly sixty EMS agencies across the ten counties.

126. "CHEMPACK" CHEMM," Accessed September 9, 2018. https://chemm.nlm.nih.gov/chempack.htm; "National Disaster Medical System," PHE. Accessed September 9, 2018. https://www.phe.gov/Preparedness/responders/ndms/Pages/default.aspx.

B. A COMMUNITY OF PRACTICE

> "The central issue in learning is about becoming a practitioner, not learning about practice."[127]
>
> —John Seely Brown and Paul Duguid

I pursued working at the Denver Paramedic Division in 1993 because of its system model, its reputation for having the best paramedics in Colorado, and being one of the best groups of paramedics anywhere. The model, a "third service" model, "a stand-alone department within a city or county government, like the fire and police departments, that is dedicated to emergency ambulance service," has been Denver's EMS model in the modern era.[128] Previously, the ambulance service has been a service of Denver General Hospital, run by the police department.[129] It has been part of the Department of Health and Hospitals, and under the Denver Health and Hospital Authority, it is a core service of DHHA. It has always been a third service, in the definition above.[130]

I was drawn by the Paramedic Division's dual-paramedic staffed ambulance model, and its primary focus on emergency medicine, at least as I perceived it as an outsider. "DG Paramedics," as they were known, were the "cowboys" who were adept at showing up with a swagger, handling anything calmly and expertly, and moving on to the next call. It was an elite community of skilled emergency care providers. I was a member of a different community of practice among the greater EMS community in the Denver area, but being the "new guy" at the Paramedic Division entailed a process for situated learning and becoming a part of the community of practice at the Division, as Lave and Wenger describe in their 1991 publication.[131] I had heard the stories and was drawn to them.

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127. Brown and Duguid, "Organizational Learning and Communities of Practice," 99.

128. "The Myth of the Perfect Model," EMS World. Accessed August 19, 2018. https://www.emsworld.com/article/10322477/myth-perfect-model.

129. Denver Health, "Then and Now: Ambulances,"

130. EMS World, "The Myth of the Perfect Model,"

131. Lave and Wenger. Situated learning.

The Paramedic Division's established community of practice includes its own workflow and culture, and a socially constructed identity found in other organizations and healthcare settings.[132] Lave and Wenger introduced the concept in their 1991 work, and Wenger went on to succinctly define them: "Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly."[133] Part of "do[ing] it better" requires ongoing knowledge sharing as part of the process of incorporating new members into the community of practice.[134] Bechky's analysis of meaning in organizations finds meaning to be heterogeneous, constructed from individual understandings of the social world based on personal experiences and interactions with it. These variations in social constructions require reconciliation.[135] This can be extrapolated to members of communities of practice.

A community of practice has members "informally bound by what they do together...and by what they have learned through their mutual engagement in these activities."[136] Their knowledge results from the varying perspective and expertise of the community of practice's members. It does not exist as explicit knowledge that can be passed from one member to another, abstracted from the work from which it arises.[137] Wenger describes three dimensions along which a community of practice defines itself, to include what the joint enterprise is about, how it functions, and what capability it produces.[138] The Paramedic Division's members have an understanding of the joint enterprise that is OHEMS in Denver, as communicated through its written policies, procedures and protocols, its cultural practices and "rules" of engagement; through its field

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132. Lave and Wenger.

133. Etienne Wenger, "Communities of Practice: Learning as a Social System," The Systems Thinker, January 21, 2016. https://thesystemsthinker.com/communities-of-practice-learning-as-a-social-system/.

134. Etienne Wenger and Beverly Wenger-Trayner, "Introduction to Communities of Practice," 2006, 1, http://wenger-trayner.com/introduction-to-communities-of-practice/.

135. Bechky, "Sharing Meaning," 321-23.

136. Wenger, "Communities of Practice: Learning as a Social System," 2.

137. Ernesto Arias, Hal Eden, Gerhard Fischer, Andrew Gorman, and Eric Scharff, "Transcending the Individual Human Mind—Creating Shared Understanding Through Collaborative design," *ACM Transactions on Computer-Human Interaction (TOCHI)* 7, no. 1 (2000), 87.

138. Wenger, "Communities of Practice: Learning as a Social System," 2.

training program and the daily work and social interactions between its practitioners and outsiders; and through the capabilities it produces. Wenger describes capabilities as a "shared repertoire of communal resources (routines, sensibilities, artifacts, vocabulary, styles, etc.) that members have developed over time."[139]

Among the Paramedic Division's capabilities are its routines for readiness for duty, the sui generis of running EMS calls "the Denver Paramedic way," the organizational pride and swagger with which it is imbued, and its unique vocabulary that is not in any glossary, but whose practitioners employ subconsciously. These communal resources and knowledge help to create group identity such as the use of the artifact term "DG Paramedics," a historical artifact still used by members of the Paramedic Division to describe themselves; a reference to when it was part of the Department of Health and Hospitals and affiliated with Denver General hospital.[140] This artifact has a particular meaning about generational, historical, and somewhat mythical representations of the Denver Paramedics, including its frequently being referenced as part of the "Knife and Gun Club."[141]

These translations and communications of organizational knowledge allow for the community of practice to develop from and around the work itself, in a busy county EMS system affiliated with an academic level I trauma center.[142] The constellation of resource availability, operational constraints, interdisciplinary relationships and work, and system design has influenced and shaped the Paramedic Division's community of practice.

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139. Wenger.

140. Wenger, 229.

141. Eugene Richards, *The Knife and Gun Club: Scenes from an Emergency Room* (New York: Atlantic Monthly Press, 1989). Eugene Richards' book contributed to Denver Paramedics' national notoriety and reputation, and people all over the country still refer to Denver Health and the Paramedic Division this way.

142. Star, "This Is Not a Boundary Object," 603; Carlile, "Transferring, Translating, and Transforming," 558-59; "The Verification, Review, and Consultation Process," American College of Surgeons, accessed August 5, 2018. https://ww.facs.org/quality-programs/trauma/vrc/process. States and their designated agencies are the accrediting bodies for trauma centers. Level I is the highest level of accreditation for trauma centers, and the designation means that the center meets the highest level of capability according to The American College of Surgeons' verification process. The process is intended to assure that trauma centers meet the criteria of the College's best practices for care of trauma patients.

The community of practice at the Paramedic Division communicates knowledge to new adherents using mechanisms consistent with Carlile's 3-T model (Figure 3).[143] The Division manages organizational knowledge by transfer, translation, and transformation. The *transfer* of knowledge happens initially through the orientation of new members during a four week long new-hire academy, during which staff familiarize new employees with policies and procedures, medical protocols and routines for payroll, benefits, familiarization with processes, and some hands-on training.[144] It is during the academy that the recruits learn about medical protocols, medical documentation, communications protocols, and the stated or written expectations, roles and responsibilities of being a Denver Paramedic.

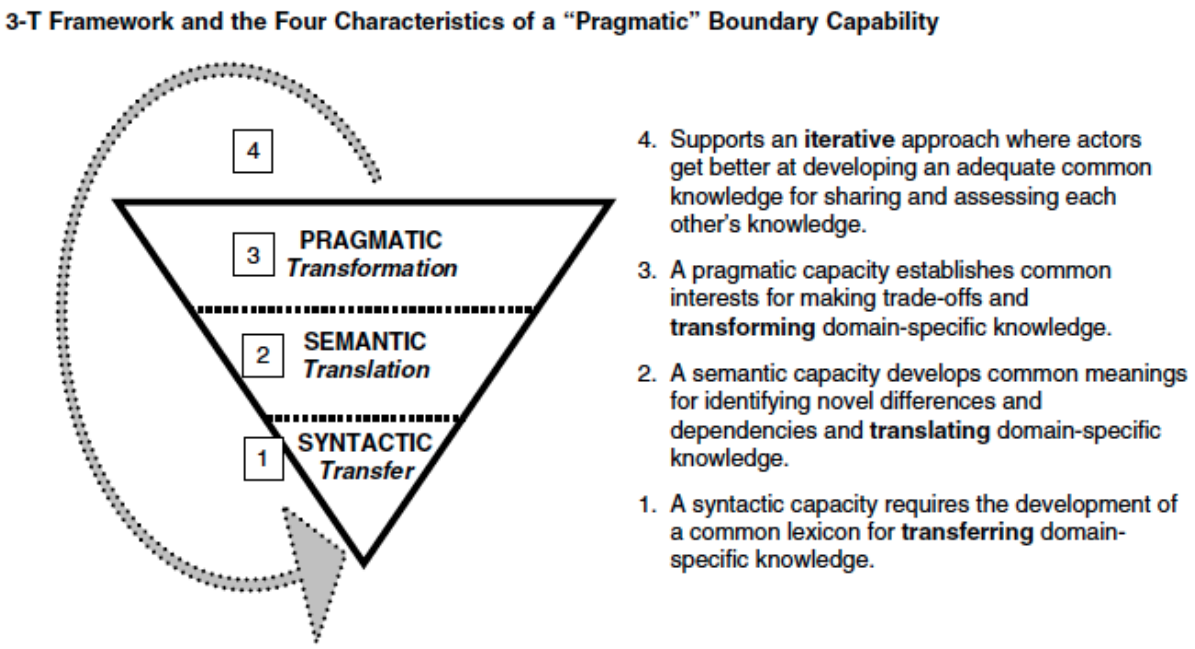

Figure 3. Carlile's 3-T Framework[145]

143. Carlile, "Transferring, Translating, and Transforming," 558-59.

144. Carlile, 558.

145. Source: Carlile, 563.

Brown and Duguid refer to this type of learning as canonical—as the term implies, "written."[146] Yanow refers to transfer of knowledge as "an objectification or commodification of knowledge, extrapolated from its context, with the translator serving as a mere conduit or channel through whom the meaning simply passes."[147] The academy and its instructors are these conduits, transferring this objectified, abstract knowledge through its onboarding process. Recruits get this knowledge in traditional written forms, policies and procedures, and through lectures.

There is a chasm between this knowledge and its application in the actual work of the job. Common conversations between FTs and their trainees include those such as "Forget about what you learned in the academy. That doesn't mean anything in the real world." Brown and Duguid recognized this dynamic in their work, particularly in organizations trying to manage work through written practices. They caution that a reliance on canonical knowledge can "blind an organization's core to the actual, and usually valuable practices of its members (including noncanonical practices, such as 'work arounds.')"[148]

The canonical learning is an important piece of bringing new adherents into the Paramedic Division. Some of this knowledge is another boundary object, allowing for collaboration in the medical care domain. There is a minimal level of standardized knowledge required to communicate with other communities of practice, namely pathophysiological, anatomical, and medical terminological knowledge that is required for continuity of patient care. If for nothing more, canonical learning provides context for the noncanonical learning. It is the actual work practices, however, that determine the organization's success.

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146. John Seely Brown and Paul Duguid "Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovation," *Organization Science* 2, no. 1 (1991): 41-43; Brown, John Seely, and Paul Duguid, "Organizational Learning and Communities of Practice: Toward a Unified View of Working, Learning, and Innovation," (2000), 101-03.

147. Yanow, "Translating Local Knowledge at Organizational Peripheries," S15.

148. Brown and Duguid, "Organizational Learning and Communities of Practice," (1991), 41.

Paramedic "work arounds" have always been the source of valuable innovation in the Division. Many of the Division's practices in place today, including the selection of particular equipment, workflows and terminology, are the products of line paramedics adapting their work to the particular EMS system in which they're embedded, including its partnerships, resources, and operational constraints.[149] This local knowledge includes the everything from the very routine to the very complex, and established members of the Division's community of practice become experts in practically understanding how their work "works," from their experiences in performing it and living through the experiences.[150]

These local adaptations and interpretations are unique to the Division's community of practice, reflect Star's and Griesemer's boundary object translations from collaborators, and support the Division's status as a boundary object.[151] While the academy teaches recruits about the "what," it is the field training (FT) program (often referred to as "the program") that teaches them the "how." The field training academy is the *translational* phase for knowledge sharing at a boundary.[152] Carlile describes the transition, in this case from the academy to the program: "The transition from a syntactic to a semantic boundary occurs when novelty makes some differences and dependencies unclear or some meanings ambiguous." This is certainly the case with this transition, the knowledge to practice transition, which Brown and Duguid term "noncanonical practices."[153]

Another important component of translating noncanonical practice is storytelling.[154] The Division, like every EMS agency with which I have ever had contact,

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149. Paul R. Carlile, "A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development," *Organization Science* 13, no. 4 (August 1, 2002): 446. Carlile discusses the interconnection between knowledge and practice, as embedded in the technologies, methods, and rules of thumb used by individuals in a given practice.

150. Yanow, "Translating Local Knowledge," S10.

151. Star and Griesemer, "Translations and Boundary Objects," 390-91.

152. Carlile, "Transferring, Translating, and Transforming," 563.

153. Brown and Duguid, "Organizational Learning and Communities of Practice," (1991), 43-44; Brown and Duguid, "Organizational Learning and Communities of Practice," 103-05.

154. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 105-07.

has a rich history of storytelling—urban legends, historic accounts, and embellished anecdotes, which all contribute to the cohesion and fabric of the organization. Storytelling is an important piece of distributing organizational knowledge through tribal communication, and the stories within and around the EMS boundary object that is the Division are not only devices for translating organizational and EMS discipline meaning, but also shape the "the formation and expression of professional identities."[155] Brown and Duguid recognize stories and the process of storytelling as reflections of the social network through and in which the work happens. It is through storytelling that the recruits learn "the why."

Storytelling helps to establish the identities and relationships between the storyteller, members of the audience and the story itself, within the Division's practice.[156] These stories are valuable in their utility as a tool for teaching and knowledge sharing: "The stories have a flexible generality that makes them both adaptable and particular. They function, rather like the common law, as a usefully underconstrained means to interpret each new situation in the light of accumulated wisdom and constantly changing circumstances."[157] They are repositories of organizational knowledge, and as such, it is rare to hear new recruits telling stories, but rather listening intently.[158] Brown and Duguid attribute telling stories to the development of a community of practice member's identity within the group, and "and reciprocally to the construction and development of the community...Individually, in telling stories the rep is becoming a member."[159]

Many of the things the recruits learn "on paper" become unclear and ambiguous in real-world application.[160] Every call they run under the tutelage of their respective field trainers (FTs) is novel, and the FT helping trainees translate canonical knowledge into tacit

155. Clarke and Star, "The Social Worlds Framework," 126.

156. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 105.

157. Brown and Duguid.

158. Brown and Duguid, 106.

159. Brown and Duguid, "Organizational Learning and Communities of Practice," (1991), 47.

160. Star and Griesemer, "Translations and Boundary Objects," 390.

knowledge through practice, helps to indoctrinate them into the community of practice. Not only do they help demonstrate and ensure that appropriate medical care for patients happens, but the FTs act as passage points in the development of coherence about what the boundary object of the Paramedic Division is.[161] They translate through joint participation in the work—shared meaning about the Denver EMS endeavor.[162]

The Program is central to becoming a member of the community of practice and addresses the disconnection between canonical and noncanonical practice, teaching the trainees to become practitioners in the community rather than learning about practice.[163] They learn by doing, and learn to be alert to the back-talk of each situation they encounter, as their expertise grows.[164] It is these translations of knowledge that contribute not only to the community of practice, but to the shared meaning of the Division as a boundary object.[165] The transition from what Bowker and Star describe as "the illegitimate stranger," in this case the trainee, to a legitimate member of the community of practice entails a process of resolving the "tension" between the outsider and "naturalized" categories for artifacts and objects.[166]

As recruit trainees become "fully-fledged" members by getting "patched,"[167] they are established as such. They continue to establish themselves through action, and as Bowker and Star describe of communities of practice, "Membership can thus be described

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161. Star and Griesemer, 390-91.

162. Carlile, "Transferring, Translating, and Transforming," 563.

163. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 100.

164. Mary R. Schmidt, "Grout: Alternative Kinds of Knowledge and Why They Are Ignored," *Public Administration Review* 53, no. 6 (December 11, 1993), 526.

165. Star and Griesemer, "Translations and Boundary Objects," 390-392.

166. Bowker and Star. *Sorting Things Out,* 295.

167. The Paramedic Division's uniforms have two different patches. A left shoulder patch which is called the "Division Patch," incorporates a winged caduceus, and the words "Denver Paramedic Division, Denver Health," Trainees' uniforms have only this patch on the left, and nothing on the right. The right patch contains a blue star of life, a symbol of EMS, with a red Rod of Asclepius and serpent vertically through it, and the words "Paramedic, City and County of Denver" circumscribed around them. The right patch is reserved for trainees who successfully complete the rigorous FT program, and earn it. The right patch is a powerful artifact in the Paramedic Division's community of practice. There are traditions around getting "patched" that resemble some of those found in the military.

individually as the experience of encountering objects and increasingly being in a naturalized relationship with them."[168]

Translations of meaning about what EMS is do not occur just *within* the Paramedic Division, but also to outside actors. In fact, these translations, often many to many (Figure 1) and resulting from the shared meaning of doing cooperative work, contribute to the boundary object that is EMS in Denver. The members of the Division's community of practice are adept translators. Yanow attributes cultural mastery to engaged members of communities of practice in three areas—within their organizations, in their own practices, and with external organizations with whom they interact.[169] The members are "nodes for the exchange and interpretation of information. Because members have a shared understanding, they know what is relevant to communicate and how to present information in useful ways."[170]

The translations from actors in the Denver Paramedic Division's community of practice about what EMS *in Denver* is, likely differ from what even neighboring jurisdictions' services interpret EMS to be. For example, there are multiple agencies geographically contiguous to the City and County of Denver, who provide EMS out of the fire service. Some provide patient transport, and some do not. Those who do not transport, typically contract the care during transport and patient transport to private ambulance service providers, who also perceive EMS through their own local meaning. These meanings reflect the structure of their services, the different actors with which they interact, and the collaborative work. In their locally constructed definitions of EMS, transportation is not a key characteristic for services who do not do it. That is, they represent different communities of practice, and their perceptions arise from the work itself, within them.

Disparate communities of practice are working in the boundary object of EMS, without consensus about what that means, and can collaborate in the more global boundary object that is EMS, despite differing local interpretations. They are "Groups that are

168. Bowker and Star, *Sorting Things Out,* 295.

169. Yanow, "Translating Local Knowledge," S16.

170. Wenger, "Communities of Practice: Learning as a Social System," 5-6.

cooperating without consensus tack[ing] back-and-forth between both forms of the object."[171] In this case, the two forms of the object might be 1) the locally derived meanings of what EMS is in a particular community of practice, and 2) the more global endeavor of EMS in the ten county NCR.

Negotiating meaning at the boundaries between communities of practice requires the *transforming* of knowledge necessary "to effectively share and assess knowledge at the boundary."[172] This transformation is not easy, or to be taken lightly, as "practice" in a community of practice is an investment, according to Carlile, who ascribes costs to transforming domain-specific and common knowledge at boundaries.[173] There are certainly costs between communities of practice if they are to adopt new or transformed knowledge from other communities of practice, putting the knowledge the community has developed "at stake."[174] This is not easy for the community or individual actor to give up or change, regardless of the novelty of a situation.

Locally acquired knowledge and a community of practice's resulting translations of boundary objects are persistent because the knowledge represents an investment.[175] Star and Griesemer, in their descriptions of the many to many translations of meaning, note that actors make themselves make themselves "obligatory points of passage" for the translation of the boundary object meaning to and from their allies.[176] Once they have done this, they must "defend it against other translations threatening to displace it."[177] EMS nationally reflects the efforts and translations of thousands of local entrepreneurs, connected by a common term and some initially standardized methods from the EMSSA. The persistence of these local interpretations is one of the challenges of scaling, particularly in the setting

171. Star, "This is Not a Boundary Object," 605.

172. Carlile, "A Pragmatic View," 445.

173. Carlile.

174. Carlile.

175. Carlile.

176. Star and Griesemer, "Translations and Boundary Objects," 391.

177. Star and Griesemer.

of locally defended perceptions of an EMS object that may not be coherent with the broader one.[178]

Carlile refers to these perceptual conflicts as arising along "pragmatic boundaries," where domain-specific knowledge (local translations, in Star and Griesemer's model), as well as the common knowledge used (the greater object in Star and Griesemer's model), "may need to be transformed to effectively share and assess knowledge at the boundary."[179] The success of these efforts depends on the respective passage points' willingness and ability to alter their own knowledge or meaning, and influence the knowledge or interpretation of others.[180] The boundary object that is the Denver Paramedic Division is a local interpretation of the boundary object that is EMS at the local level. It is one translation of the coherent meaning of the broader boundary object that is EMS. At the regional, state and national levels, the same negotiations of meaning about what EMS is happen, and actors defend these meanings.

178. This is a potential policy disconnect that will be discussed later.

179. Carlile, Paul R, "Transferring, Translating, and Transforming," 559.

180. Star and Griesemer, "Translations and Boundary Objects," 390-91.

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V. TRANSLATIONS OF THE EMS OBJECT IN PREPAREDNESS

> "Assigning things, people, or their actions to categories is a ubiquitous part of work in the modern, bureaucratic state."[181]
>
> —Geoffrey Bowker and Susan Leigh Star

At the organizational level, the Denver Health Paramedic Division is a boundary object, emerging from the work of its community of practice. Those within it, in this case line paramedics, mechanics, Vehicle Support Technicians (VSTs), EMTs, dispatchers, command staff, support personnel and others, each have a perception of what the Division is, derived through their respective collaborative work in the organization, and translations of meaning from those who have made themselves "obligatory points of passage."[182] The Division is a coherent object. The Paramedic Division's community of practice has been translating, renegotiating, debating, triangulating and simplifying to create shared meaning about the EMS object for decades.[183] The community of practice has changed with the demographic changes in the workforce through members' departure and arrival, with changes in size, scope and responsibility, and with the evolution of medical and operational practices and equipment.

One obligatory passage point in the coherent boundary object of the Paramedic Division is the Denver Health and Hospital Authority, its parent organization. It is also a coherent boundary object to other constituent *components* of DHHA. To the finance department, the Division represents a revenue stream, both in direct billing, and a source of downstream revenue, as it transports around forty percent of its patients to Denver

181. Bowker and Star, Sorting Things Out.

182. Star and Griesemer, "Institutional Ecology, `Translations' and Boundary Objects," 390-391.

183. Star and Griesemer, 389.

Health Medical Center.[184] To the emergency department staff, the paramedic division is a stream of patients, and a filter that keeps some patients out of the ED through alternative dispositioning of patients. To the DHHA's administration, the Division represents a significant workforce within DHHA and a large obligation of human resource capital and cost.[185] To many of DHHA's employees, the Division are the "emergency people."

The Paramedic Division is one translation of EMS among multiple communities of practice. It is the translation of what EMS is locally, within the City and County of Denver and its other geographic response areas. Among these various communities of practice, the Division has varied coherent meanings. It is a partner in the emergency response system to its partners in law enforcement and the fire service, and as such, EMS has a particular meaning. EMS represents a revenue stream and source of downstream revenue to the other twelve hospitals to which the Division transports patients, as it is to DHMC. To regional ED staff, it represents a source of patient flow. To 911 callers, it is help for medical emergencies, accessed through the phone. To the patient, it may represent help in the form of professional, uniformed paramedics arriving at the scene of an emergency. These varying translations of meaning are not likely unique to the Division, as EMS across the nation has evolved to providing increasingly complex emergency medical care, from its transportation-centered roots.

My experience in working with EMS colleagues nationally supports the notion that there is at least one such community of practice among OHEMS providers that goes beyond local translations of what EMS is and does. As an EMS leader, I have been a part of various groups of EMS leaders in collaborative work on specific issues, and sustained global EMS efforts. This community is large, and represents the "tacking" that Star describes in her

184. This operational information is available to me as a member of the Denver Health Paramedic Division's command staff. With the exception of patient identifying information protected by the Health Insurance Portability and Accountability Act (HIPAA; Pub.L. 104–191, 110 Stat. 1936), none of which has been referenced or included in this study, the information is publicly available through the Colorado Open Records Act ((CORA) C.R.S. § 24-72-201 to 206).

185. Approximately 90% of the Division's operating budget are personnel costs. See footnote above.

2010 paper, tacking back-and-forth between their local perceptions and a broader boundary object that is EMS.[186]

My multiple translations of EMS meaning include the translation of meaning as a street paramedic as well, and I believe there is another community of practice among this group, not at the Paramedic Division level, but at more of a discipline level. This community of practice is a different one than those existing at any particular organization's level, but the community provide the same sorts of knowledge sharing pathways that Carlile describes in his 3-T Model.[187] Particularly, and potentially diagnostically, is the pervasive storytelling as knowledge sharing, to which Brown and Duguid refer.[188] The descriptions, challenges and anecdotes are common across the actors in the broader OHEMS boundary object, and anyone in OHEMS can seamlessly enter a conversation with others from around the country, and fit right in.

I propose and defend the existence of this community of practice based on the core elements that Lave and Wenger began with, and that Wenger has fleshed out through his subsequent works.[189] One only needs to spend some time with OHEMS providers to recognize consistent stories and many of the key characteristics of communities of practice, as Roberts has succinctly distilled from Wenger's work:

- Sustained mutual relationships – harmonious or conflictual
- Shared ways of engaging in doing things together
- The rapid flow of information and propagation of innovation
- Absence of introductory preambles, as if conversations and interactions were merely the continuation of an ongoing process

186. Star, "This Is Not a Boundary Object," 605.

187. Carlile, "Transferring, Translating, and Transforming," 563.

188. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 100.

189. Lave and Wenger. *Situated Learning*; Joanne Roberts, "Limits to Communities of Practice," *Journal of Management Studies* 43, no. 3 (2006): 625. Roberts, in her paper, has compiled a comprehensive list of community of practice characteristics, synthesized from Wenger's works.

- Very quick setup of a problem to be discussed
- Substantial overlap in participants' descriptions of who belongs
- Knowing what others know, what they can do, and how they can contribute to an enterprise
- Mutually defining identities
- The ability to assess the appropriateness of actions and products
- Specific tools, representations, and other artifacts
- Local lore, shared stories, inside jokes, knowing laughter
- Jargon and shortcuts to communication as well as the ease of producing new ones
- Certain styles recognized as displaying membership
- A shared discourse reflecting a certain perspective on the world[190]

In my experience, anyone who is a member of any of these multiple communities of practice among OHEMS leaders and OHEMS providers at any level of scale could easily give examples of how OHEMS reflects these characteristics. The existence of these multiple communities of practice support EMS status as a boundary object, as these communities can successfully scale their interpretations from highly localized to worldwide, maintaining some coherence about the activities in which they are engaged.

All of the representations change meaning depending upon the particular level of scale. The differences are in the way the object is interpreted and used.[191] At a local level, EMS meets the definitions of a boundary object, which Star describes as "essentially organic infrastructures that have arisen due to…'information and work requirements,' as

190. Roberts, 625.

191. Star, "This Is Not a Boundary Object," 605.

perceived locally and by groups who wish to cooperate."[192] They are objects that others act with, around, to and toward. They are not statically tangible, but rather come into being because of action.[193]

A. EMS IN PREPAREDNESS POLICY

Part of upholding the public trust is ensuring not only care for individual members, but to ensure scaling. It means taking care of the actual *and potential* patients, which involve policy conversations. Developing coherent EMS policy is difficult, either for EMS' daily operations, or for preparedness, particularly in the absence of agreement about what it even is. It requires collaborative work and the efforts of many different actors and entrepreneurs. How can all of these people and groups collaborate successfully without agreement or consensus about what EMS is? Star and Griesemer, in their analysis of the Berkeley Museum of Vertebrate Zoology (MVZ), encountered a similar situation.

In the MVZ case study, various social worlds cooperating in the shared goals "of conserving California and nature, and of making an orderly array out of natural variety...lined up in such a way that everybody [had] satisfying work to perform in each world."[194] EMS, similarly, developed in response to a particular set of problems that garnered enough public and political attention to spark myriad stakeholders to collaboratively address.[195] The patchwork quilt of EMS in the nation reflects the local EMS system development and local meanings that arose through the work to build them.

As in MVZ example, this set of problems required "an evolving set of practices instituted to manage the particular sort of work occasioned by the intersection of the professional, amateur, lay and academic worlds...several groups of actors—amateurs,

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192. Star, 602.

193. Star, 603.

194. Star and Griesemer, "Translations and Boundary Objects," 388, 408.

195. Star and Griesemer, 408. Star and Griesemer discuss the importance of the "common goal," in creating coherence. In the case of EMS, the particular set of problems were those outlined in the 1966 NIH paper, related to death and disability on American roadways.

195. Star and Griesemer, "Translations and Boundary Objects," 391-392.

professionals...bureaucrats" and others.[196] The MVZ emerged as an object that allowed all of the actors across these social worlds to successfully collaborate with and in a "boundary object."[197]

A potential problem of the EMS boundary object in preparedness activities beyond those at the local level, is that planning must assume a particular form of the object when the action is required—that is, an operational plan developed for EMS describes only a particular understanding of EMS. A national plan developed by a federal agency will reflect a federal view, whereas a state plan will reflect a state view and so on. This may disregard the local perceptions by "groups who wish to cooperate," for a more predictable and static form of the object, leading to potential mismatches and conflict between local and broader forms of the object, particularly when the local interpretations of what EMS is and does, do not match with the needs in the plan. This disconnection creates a recipe for unrealistic expectations and potential failure. Star, in her 2010 paper, discusses the role of standardization in the lifecycle of boundary objects.[198]

Policy creation, a creative endeavor, often disregards the local knowledge, deferring to scientific analyses and expert opinions. Abstract knowledge in American society has more value than the details of practice, which "have come to be seen as nonessential, unimportant, and easily developed once the relevant abstractions have been grasped."[199] Local knowledge and expertise, as Yanow recognizes, incorporates local situations, and is "often juxtaposed with 'expert' knowledge," which comes through formal academic training.[200] Much of the "expert" knowledge in the case of EMS, using this definition, comes from physicians, who have the formal academic training she describes, and a close historical and clinical medical connection to OHEMS providers. Few, however,

196. Star and Griesemer. "Translations and Boundary Objects," 391-392

197. Star and Griesemer, 408.

198. Star, "This Is Not a Boundary Object," 613-15.

199. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 100.

200. Yanow, "Translating Local Knowledge," S9–25.

have the situated knowledge of managing OHEMS operations and/or large-scale incidents outside of the walls of a hospital.

There are power dynamics among the groups working in and around the OHEMS boundary object. An innovation dynamic in the preparedness policy space within the EMS community of practice, as Fox recognizes, "is inevitably an extended and complex process, requiring analysis of the values and beliefs of the community, something not undertaken in the boundary object literature."[201] My own translations of meaning as an OHEMS community of practice member, reflect my values and beliefs, which certainly reflect my policy preferences.

In early EMS policy development, the lack of a cohesive voice among OHEMS actors relegated their voices to being *implicated* in the policy development of the Highway Safety Act and the EMSSA. They were only discursively present, and without power in the policy arena.[202] Clarke and Star recognize one type of implicated actor as being "those who are physically present but are generally silenced/ignored/made invisible by those in power in the social world or arena."[203] As an implicated actor, neither OHEMS personnel's representations of the EMS object, nor their identities were explored in the negotiations, but rather commoditized as primarily a transportation resource.[204]

One key power dynamic exists between physicians and the OHEMS "workers," who possess the hard-won situated local knowledge about OHEMS, and its true capabilities and limitations.[205] It is important to acknowledge this dynamic, as well as the potential value of local knowledge, so as not to craft policy based on abstract knowledge and expert opinion, that crumbles and fails, as the dam did in Schmidt's example.[206] Roberts recognizes this dynamic as well, and her description is particularly relevant to the policy

201. Fox, "Boundary Objects," 74-75.

202. Clarke and Star, "The Social Worlds Framework," 119

203. Clarke and Star.

204. Clarke and Star.

205. Carlile, "A Pragmatic View," 445.

206. Schmidt, "Grout," 525–30.

discussion. She notes that, "While workers may be full participants in their own community of practice, their knowledge, despite its relevance for the formulation of strategy, is not necessarily recognized within the formal organizational hierarchy where, so called, expert knowledge, acquired from external consultants, is preferred."[207]

My intention here is not to victimize OHEMS providers as dependent blue collar workers, but rather to comment on the typical sources of "expertise" in the policy space. On the contrary, OHEMS has undervalued its own knowledge as a community of practice, and its actual and potential contributions to preparedness policy. In Star's and Griesemer's many to many translations model (Figure 1), some of the translations have louder voices than others, a situation that Carlile, Schmidt, Roberts and others have acknowledged in their observations of communities of practice.[208]

Another area of "agreement," among the EMS communities of practice is that EMS, as the connector between the public health, public safety and medical communities, includes multiple models for delivering its emergency medical services.[209] These models reflect the tapestry of EMS' historic development, and subsequent evolution from transportation to medical care and public safety emergency response.[210] The delivery model is a community decision, and the work within the model is part of the development of the community of practice and the boundary object that is EMS in the particular community.

Another power dynamic, however, arises from the focus on EMS delivery models. The type of delivery model influences the perception and translation of the EMS boundary object. For example, in jurisdictions where EMS is provided by the fire service, the actors may not even use the term EMS at all, because whatever EMS means within those

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207. Roberts, "Limits to Communities of Practice," 627.

208. See also: Jacquelyn Allen Collinson, "Just 'Non-academics'? Research Administrators and Contested Occupational Identity," *Work, Employment and Society* 20, no. 2 (2006): 267-288. Collinson makes an analogous comparison between the boundary between the community of practice identity of research administrators and their academic community of practice collaborators.

209. "The Myth of the Perfect Model," EMS World. Accessed August 19, 2018. https://www.emsworld.com/article/10322477/myth-perfect-model.

210. Institute of Medicine, Emergency Medical Services, 2.

communities is subsumed by the delivery model into potentially another boundary object. In Denver, the EMS services are associated with "EMS," "Denver Health" (DG for tenured partners and practitioners), or "the paramedics." Public safety, preparedness, and emergency management activities in Denver typically reference "police, fire and EMS" as the emergency response agencies, while in neighboring jurisdictions with EMS in the fire service, these activities typically recognize "police and fire," where "fire" is the potential EMS boundary object.

I have found delivery model discussions to be intensely political and reflect more of a focus on labor interests and the value of particular models for delivering EMS than they do the actual services.[211] At the at the national preparedness policy level of scale, these translations are amplified through relationships with political and financial implications. The relationships influence perceptions of the EMS boundary object, as well as the policy around EMS. The lack of transparent medical quality measures within the OHEMS community of practice or the medical community of practice make other arguments difficult.

Bowker and Star recognize the peril of "otherness" associated with standards in their work with information systems, circumstances that Star studied in other works, and about which she wrote in her discussion of scaling and boundary infrastructure.[212] Standardizing and categorizing delivery models has potential downsides, representing a "brute force solution to intercategory problems, with the potential for scientific and political marginality or 'otherness,'" and endangering the coherence of and cooperation within the boundary object and its associated work.[213]

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211. Franklin D. Pratt, Steven H. Katz, and Paul E. Pepe. *Prehospital 9-1-1 Emergency Medical Response: The Role of the United States Fire Service in Delivery and Coordination* (Washington, DC: Congressional Fire Service Institute), 2007, http://fireserviceems.com/. Visit their website for this white paper on the virtues of delivering EMS services through the fire service. A cursory look at the page will reveal the International Association of Firefighters, a powerful labor organization, among the organizations with which it affiliates as sponsors of the page and the resources available from it.

212. Star, "This is Not a Boundary Object," 609-12; Bowker and Star. *Sorting Things Out,* 287.

213. Star, 609.

To avoid the pitfalls of this line of inquiry, the following policy discussions will disregard as much as possible, the delivery models for EMS and focus on the services and capabilities, recognizing that the local perceptions of the EMS boundary object and the communities of practice from which they emerge are intimately associated with the models. Successful national preparedness policy around EMS must recognize that there is not a standardized delivery model or EMS system. The capabilities of the EMS object, however, are important for the cooperating communities of interest to determine, as the nation's mandate for capability-based preparedness planning requires it.[214]

B. EMS ROLES AND CAPABILITIES

> "Abstractions detached from practice distort or obscure intricacies of that practice."
>
> —John Seely Brown and Paul Duguid [215]

Since the effective repeal of the EMSSA in 1981, there has been piecemeal support for EMS through multiple federal agencies, typically within the narrow interest of the respective departments, without coordinated effort or funding on a global level.[216] The repeal of the EMSSA and the change from targeted DHEW funding for EMS systems to block grant funding to states for preventive health services, reduced EMS funding and centralization of federal influence over EMS. With no authority to standardize the methods of EMS system development and minimal program funding, the vestigial Office of EMS under the National Highway Transportation Administration (NHTSA) has been left as the only contact point for local EMS within the federal government.

In the wake of the events of September 11th, the inadequacies of emergency medical response to the event led Senators Collins and Feingold to commission a report by the

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214. Barack Obama, *National Preparedness,* PPD-8 (Washington, DC: The White House, 2011). PPD-8 mandates a capabilities-based approach to national preparedness planning.

215. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 100.

216. United States Senate, *Emergency Medical Services Support Act,* Report 108-291 (Washington, DC: United States Senate), accessed May 21,2015. http://www.gpo.gov/fdsys/pkg/CRPT-108srpt291/html/CRPT-108srpt291.htm.

Government Accountability Office (GAO), to "…identify (1) the needs reported by local EMS systems and state regulatory agencies for improving EMS outcomes and (2) the efforts of federal agencies in supporting and promoting EMS improvements."[217] The findings in this report and others, led members of the Senate Committee on Governmental Affairs to propose The Emergency Medical Services Support Act (Senate Bill 2351). Accompanying the legislation was a report, advocating for the creation of a Federal Interagency Committee on EMS (FICEMS) to provide improved federal support and funding coordination for EMS.[218] FICEMS agencies include the Departments of Transportation (NHTSA), Homeland Security, Health and Human Services and Defense, as well as the Federal Communications Commission.

The Emergency Medical Services Support Act was introduced but never moved past introduction. FICEMS, however, was ultimately created as an add-on to the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).[219] Improving federal coordination of EMS through FICEMS, and prioritizing funding for EMS projects out of the individual FICEMS agencies' budgets has structural problems, however, in improving the state of American EMS systems. The committee has a rotating chair, and none of the agencies has influence over any of the others' funding, even for EMS programs, if there is EMS funding at all.[220] This leadership by committee approach has the limitation of a diffusion of responsibility for all member agencies, and a lack of authority for any one agency to drive changes that may impact the others.[221] The FICEMS agencies are collaborating in an EMS boundary object, but the varying perceptions preclude meaningful policy action among a group convened for just this purpose.

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217. United States Government Accountability Office, *Emergency Medical Services: Reported Needs are Wide-ranging, with a Growing Focus on Lack of Data* (Washington, DC: United States Government Accountability Office, 2001), http://www.gao.gov/new.items/d0228.pdf.

218. Emergency Medical Services Support Act; EMS, "FICEMS."

219. Safe, Accountable, Flexible and Efficient Transportation Equity Act, Public Law 109-59 (2005).

220. EMS, "FICEMS."

221. Cilluffo, Kaniewski, and Maniscalco, "Back to the Future," 12.

In the United States, OHEMS provides out of hospital emergency medical care and patient transport to millions of citizens of and visitors to the United States of America each year. According to the 2011 "National EMS Assessment," the most comprehensive attempt at assessing EMS in the U.S. using available, disparate data sources, over 825,000 EMS providers responded to nearly 37 million EMS incidents, treating and transporting over 28 million patients that year.[222] While likely the best available, these numbers, because of the challenges of data collection, completeness and definitions, are questionable at best.

EMS personnel deliver services to the sick and injured across America, twenty-four hours a day, 365 days a year in all weather, and in all environments. In most communities, EMS is a key component of the community's emergency response system along with firefighting and law enforcement functions (the DHS translation). Commonly accessed through 911 emergency call systems nationwide, EMS is a service that communities widely expect.

Since their early beginnings, EMS systems in the United States have evolved into a system of varied, disparate, highly localized systems. An EMS system, as defined in the EMS Systems Act of 1973 (EMSSA), is a system "…which provides for the arrangement of personnel, facilities, and equipment for the effective and coordinated delivery of health care services under emergency conditions (occurring either as a result of the patient's condition or of natural disasters or similar situations), and which is administered by a public or nonprofit private entity which has the authority and the resources to provide effective administration of the system to an appropriate geographical area."[223] This definition is broad, and while it identifies the function of the system, it is rather nebulous about what these components are, or how best to arrange them to achieve the intended outcomes. Nor does it clearly identify what an appropriate geographical area might be.

222. EMS, "FICEMS." While this assessment is the most comprehensive to date, the authors acknowledge the limitations of its accuracy in terms of available data, leaving even what would seem to be the most fundamental information, like the numbers of EMS providers in the United States, in question. This may be partially due to data collection issues, definitions or both.

223. Emergency Medical Services Act.

A more contemporary definition of EMS systems, from the National Highway Transportation Safety Administration's (NHTSA) Office of EMS, is more prescriptive, identifying necessary components for each system, and the fact that each component has essential roles in the "coordinated and seamless system of emergency medical care."[224] The NHTSA definition includes as requisite EMS system components:

Agencies and organizations (both private and public)

Communications and transportation networks

Trauma systems, hospitals, trauma centers, and specialty care centers

Rehabilitation facilities

Highly trained professionals

Volunteer and career prehospital personnel

Physicians, nurses, and therapists

Administrators and government officials

An informed public that knows what to do in a medical emergency"[225]

Heterogeneous groups and people from different social worlds involved with EMS systems have worked together across domains to make them function to serve their respective communities. The communities have a goal for what the system should provide, created through the cooperative work of building and maintaining it. EMS systems have different meaning to each stakeholder, and cooperation in the enterprise of EMS system development has entailed reconciliation of these different meanings, and ostensibly reflect the public's choices.

In the realm of preparedness doctrine, one translation of the EMS boundary object is that it is a component of the nation's emergency services sector (ESS).[226] EMS is inherently an emergency service response entity whose regular partners include the other

224. EMS, "What Is EMS?"

225. EMS.

226. Department of Homeland Security, "Emergency Services Sector,"

members of the ESS—law enforcement, fire suppression, public works and emergency management. The ESS, according to the Department of Homeland Security, is "A system of prevention, preparedness, response, and recovery elements," that "represents the nation's first line of defense in the prevention and mitigation of risk from both intentional and unintentional manmade incidents, as well as from natural disasters. The ESS also serves as the primary protector for the other 15 critical infrastructure sectors."[227]

Another potential area of agreement about the OHEMS boundary object, is that it is an out of hospital, "24/7/365" service, configured to operate in the field through the use of vehicles, mobile communications, command and control structures and trained personnel. As an ESS component, EMS is also tasked with protecting the other components of the ESS and other of critical infrastructure sectors. There are several specialized capabilities under the ESS, including include hazardous materials response, search and rescue, explosive ordnance disposal (i.e., bomb squads), tactical law enforcement operations, aviation units (i.e., police and medevac helicopters), and public safety answering points (PSAPs—911 call centers).[228]

Other roles may include, in addition to 911 emergency medical response, medical call screening in the PSAPs, aeromedical care, medical support for special operations (the special capabilities above), special event EMS coverage and other field medical support activities like dignitary protection details, etc. While listed as roles of ESS elements, the capabilities to provide the care in these environments are poorly, if at all, defined in federal doctrine. The IOM identified among key objectives of EMS systems, "to ensure that each patient is directed to the most appropriate setting based on his or her condition. Coordination of the regional flow of patients is an essential tool in ensuring the quality of prehospital care, and also plays an important role in addressing systemwide issues related to hospital and trauma center crowding."[229] While this is an important role in most EMS systems, it is not reflected as such in federal EMS doctrine or capabilities.

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227. Department of Homeland Security.

228. Department of Homeland Security, "Emergency Services Sector."

229. Institute of Medicine, *Emergency Medical Services,* 4.

The National Preparedness Goal identifies core capabilities across the five mission areas of prevention, protection, mitigation, response and recovery. EMS is mentioned in the document once, under the Response Mission Area's Public Health, Healthcare and Emergency Medical Services[230] core capability. This is an improvement since the last version, which did not even mention EMS in the core capability. The core capability is to "Provide lifesaving medical treatment via Emergency Medical Services and related operations and avoid additional disease and injury by providing targeted public health, medical, and behavioral health support, and products to all affected populations."[231]

Under this core capability, the relevant preliminary targets are to "1. Deliver medical countermeasures to exposed populations. 2. Complete triage and initial stabilization of casualties and begin definitive care for those likely to survive their injuries and illness. 3. Return medical surge resources to pre-incident levels, complete health assessments, and identify recovery processes."[232] Of these preliminary capability targets, only the "Complete triage and initial stabilization of casualties," and "Return medical surge resources to pre-incident levels," are relevant to the response functions identifies for the ESS.[233]

In the system of Emergency Support Function (ESF) coordination, leadership and support, this core capability falls under Emergency Support Function #8, Public Health and Medical Services, the lead agency and ESF Coordinator for which is the United States Department of Health and Human Services.[234] There are multiple translations of the EMS boundary object in federal doctrine that are not necessarily aligned, and the resulting capabilities associated with the diverse translations are not either.

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230. "Core Capabilities," FEMA. Accessed August 23, 2018. https://www.fema.gov/core-capabilities.

231. FEMA.

232. "Emergency Support Functions," PHE, accessed August 23, 2018. https://www.phe.gov/Preparedness/support/esf8/Pages/default.aspx#hea.

233. "National Preparedness Goal, Second Edition." Department of Homeland Security, 2015, 16, https://www.fema.gov/media-library-data/1443799615171-2aae90be55041740f97e8532fc680d40/National_Preparedness_Goal_2nd_Edition.pdf.

234. Department of Homeland Security; PHE,"Emergency Support Functions."

Structurally, DHS claims EMS is part of the ESS, and depending on which federal doctrine, so does HHS. From a policy and doctrine perspective, the departmental translations of the EMS boundary object leave whatever EMS is, in federal policy limbo. It is difficult to craft policy around something one cannot define.

For example, the Secretary of the U.S. Department of Health and Human Services, in the 2009 National Health Security Strategy, recognized that "Emergency response efforts are sometimes disparate; and effective coordination is often lacking across governmental jurisdictions, communities, and *the health and emergency response systems* (italics added)." The secretary goes further in defining these in the associated footnote, "The health system includes all parts of the health care delivery system (e.g., primary and hospital care, disaster medicine, and behavioral health care) and the public health system. The emergency services system includes police, fire, emergency medical services, and emergency management."[235] This is consistent with the Secretary of the Department of Homeland Security's view of EMS, also as a component of the ESS.[236]

Personnel who operate "in the field" in EMS in the United States, assuming the broader EMS boundary object interpretation, include telecommunicators, the public and first responders, emergency medical technicians (EMTs) and paramedics, flight nurses, and occasionally physicians and other health professionals. At the organizational level, different perceptions of the object exist, and even among these OHEMS actors, there are distinct communities of practice contributing to the object. One community of practice among these is the OHEMS clinician community of practice, that I assert, is primarily the domain of paramedics and EMTs.

C. EMS AND PREPAREDNESS DOCTRINE

The EMS Systems Act was effectively repealed in the Consolidated Omnibus Budget Reconciliation Act (COBRA) of 1981. The COBRA changed EMS system line

235. U.S. Department of Health and Human Services, *National Health Security Strategy of the United States of America* (Washington, DC: U.S. Department of Health and Human Services, 2009),7.

236. Department of Homeland Security, "Emergency Services Sector,"

item funding to block grant funding to states for preventable health issues.[237] With no specific EMS system funding, states were left to provide leadership for EMS system development and oversight. The COBRA of 1981 was the last time there was a lead federal agency for EMS. The shift toward block grant funding led to the dissolution of the EMS office in HEW and the shift of responsibility to the DOT to continue the EMS mission through a small office buried in the expansive DOT bureaucracy the National Highway Transportation Safety Administration (NHTSA), without the same funding or authority that HEW had as the lead agency.[238]

Currently, there is no designated lead federal agency for EMS in the United States. Over thirty different federal agencies have some EMS connection, but none have oversight or significant funding for EMS, leaving it without consolidated federal leadership, accountability, responsibility or oversight. This has practical, everyday consequences, in addition to preparedness implications. The George Washington Homeland Security Policy Institute's 2005 report "Back to the Future: An Agenda for Federal Leadership of Emergency Medical Services," declares that a lead agency for EMS should:

- Lead national EMS policy
- Be funded at an appropriate level for this critical national mission
- Manage and update existing EMS education and vehicle standards
- Be the EMS providers' voice in the federal government
- Examine EMS responder safety issues
- Collect and disseminate EMS data, as USFA and the Bureau of Justice Statistics do for the other first responder constituencies
- Be the central clearinghouse for EMS information, funding and standards

237. Cilluffo, Kaniewski, and Maniscalco, "Back to the Future," 8.

238. Cilluffo, Kaniewski, and Maniscalco.

- Manage national training programs
- Conduct research, including needs and capabilities assessments"[239]

It is clear from the example of the Highway Safety Act and the EMSSA, that federal policy guidance and leadership can influence local efforts, as EMSSA's fifteen essential elements of EMS systems did, particularly if there is the right combination of leadership, public and political attention, and the use of federal funding as a lever to drive policy and structure.[240]

The successes in building EMS systems and EMS capacity benefited from federal leadership, methods standardization, and the emergence of a boundary object that resulted from the work of the various actors cooperating to improve survival from traumatic injury. Since the federal government abdicated its leadership role in shaping the boundary object in 1981, with the withdrawal of funding and the dissolution of a lead agency for EMS, the local perceptions and boundary objects, in the absence of methods standardization, grew into different enough boundary objects to make tacking back-and-forth between the local object and the federal policy problematic.

The United States made significant revisions to national preparedness doctrine in the aftermath of the 9/11 attacks on the World Trade Center in 2001. In 2002, the U.S. passed the Homeland Security Act, establishing the U.S. Department of Homeland Security (DHS), reorganizing and consolidating many of the nation's preparedness activities under the new department. DHS promulgated preparedness doctrine such as the National Response Plan, which preceded the National Response Framework, the National Incident Management System, the National Infrastructure Protection Plan and many others.

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239. Cilluffo, Kaniewski, and Maniscalco, 8.

240. Institute of Medicine, *Emergency Medical Services.* The report states: "Increased recognition of the importance of EMS in the 1970s led to strong federal leadership and funding that resulted in considerable advances, including the nationwide adoption of the 9-1-1 system, the development of a professional corps of emergency medical technicians (EMTs), and the establishment of more organized local EMS systems," Strong federal leadership in the form of a designated lead agency with responsibility, authority and funding were key.

EMS is mentioned in some preparedness doctrine, but there is cause for question about the accountability for meeting the goals therein, as there is not an identified lead agency with responsibility for or authority over EMS. In PPD-8, and the resultant system for preparedness it mandates, there is a focus on identifying risks, evaluating capability requirements based on risk, building capabilities, and planning.[241] Despite being characterized as a component of the nation's critical infrastructure and key resources in the National Preparedness Goal, EMS lacks a clearly responsible or authoritative federal agency to guide and support the identification or development of capabilities, the building blocks for national preparedness under PPD-8.

The policy gaps go beyond merely unidentified leadership to overt conflict. For example, EMS is identified as a component of the Emergency Services Sector (ESS), one of the sixteen sectors of critical infrastructure, in the National Infrastructure Protection Plan, along with law enforcement, firefighting, public works and emergency management.[242] The Sector-Specific Agency for the ESS is the Department of Homeland Security.[243] In this role, DHS is responsible to:

- Coordinate with DHS and other relevant Federal departments and agencies and collaborate with critical infrastructure owners and operators, where appropriate with independent regulatory agencies, and with SLTT entities, as appropriate to implement PPD-21;

- Serve as a day-to-day Federal interface for the dynamic prioritization and coordination of sector-specific activities;

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241. "National Preparedness System," FEMA, accessed June 1, 2015. https://www.fema.gov/national-preparedness-system.

242. Department of Homeland Security, *National Infrastructure Protection Plan: Partnering to Enhance Protection and Resiliency* (Washington, DC: U.S. Dept. of Homeland Security, 2009), http://purl.access.gpo.gov/GPO/LPS113950.

243. Obama, Barack, *Critical Infrastructure Security and Resilience,* PPD-21 (Washington, DC: White House, accessed June 15, 2015, https://www.whitehouse.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil.

- Carry out incident management responsibilities consistent with statutory authority and other appropriate policies, directives, or regulations;
- Provide, support, or facilitate technical assistance and consultations for that sector to identify vulnerabilities and help mitigate incidents, as appropriate; and
- Support the Secretary of Homeland Security's statutory reporting requirements by providing, on an annual basis, sector-specific critical infrastructure information.[244]

As the "day-to-day Federal interface" for sector-specific activities, it would seem that DHS has some role as the lead agency for EMS. This notion is supported by the National Health Security Strategy, which includes EMS as a component of emergency services as well.[245] Despite this policy relationship, DHS has very little "day-to-day" interface with EMS. DHS and the Department of Health and Human Services have both declared, in doctrine, that EMS is part of the ESS, despite the fact that it involves providing medical care.

These problems are well documented. In the aftermath of 9/11, there was more attention on EMS as a component of the nation's response community, and the identified shortcomings of the status quo were presented to, and by, members of the U.S. electorate in various testimonies, proposed legislation and public commentary.[246] Issues of fragmented coordination and lack of methods standardization translate to inconsistency in quality of care, of training, of equipment, capacity and available workforce.

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244. Department of Homeland Security, National Infrastructure Protection Plan, 43.

245. "Implementation Plan for the National Health Security Strategy of the United States of America," May 2012, Department of Health and Human Services, http://www.phe.gov/Preparedness/planning/authority/nhss/ip/Documents/nhss-ip.pdf.

246. e.g. see: United States Government Accountability Office, *Emergency Medical Services;* Emergency Medical Services Support Act; National Highway Traffic Safety Administration, "EMS Agenda for the Future"; *Emergency Care Crisis: A Nation Unprepared for Public Disasters: Hearing before the Subcommittee on Emergency Preparedness, Science, and Technology of the Committee on Homeland Security, House of Representatives,* 109th Cong. 2nd, July 26, 2006.

Presidential Policy Directive 8 (PPD-8) mandates the creation of a national preparedness system. According to the directive, "The national preparedness system shall include a series of integrated national planning frameworks, covering prevention, protection, mitigation, response, and recovery. The frameworks shall be built upon scalable, flexible, and adaptable coordinating structures to align key roles and responsibilities to deliver the necessary capabilities."[247] It is difficult to align key roles and responsibilities for EMS, or to know its capacity for planning, as its capabilities are limited and largely undefined in policy.

The preparedness cycle of planning, organizing, equipping, training, and evaluating (POETE) intends to build and sustain capabilities.[248] Without a "common goal," identifying EMS capabilities and capacity, which requires matching resources (i.e. people, equipment) with the capability targets, work within the EMS boundary object at the scale of national preparedness policy will continue to be challenging.[249]

As an EMS leader, I define local capacity as the number of available personnel, vehicles, and equipment *beyond those required to maintain baseline services* to the community, but it is not defined in federal doctrine. A street paramedic may define local surge capacity as the time to arrival of the next closest available ambulance (for its people *or* its transport capability).

The terms of the FEMA National Ambulance Contract clearly define the *transportation* surge capacity for EMS in scenarios where there are large-scale regional and national needs.[250] This agreement, put out for bid and awarded to private ambulance companies based on primarily, their abilities to provide specific numbers and types of EMS *transportation* resources to identified regions of the continental United States, is the federal

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247. Obama, National Preparedness.

248. "Plan and Prepare for Disasters," Department of Homeland Security, accessed August 20, 2018, https://www.dhs.gov/plan-and-prepare-disasters.

249. Star and Giesemer, "Translations and Boundary Objects," 408.

250. "Overview of AMR-FEMA National Emergency Medical Services Contract," American Medical Response. April 24, 2015. http://www.amr.net/Files/PDFs/DRT-Companies/AMR-FEMA-contractoverview.aspx.

government's interpretation of EMS capability, intimating a focus on its historic view of the EMS boundary object as transportation. There are other signs that this interpretation of the broader boundary object exists.

For example, the current categorization of EMS services as "suppliers" of healthcare, rather than "providers" under the Social Security Act, prevents federal reimbursement to OHEMS providers for anything *other* than transportation in the Centers for Medicare Services' fee-for-service reimbursement scheme.[251] This includes both emergency and non-emergency patient transportation, which is typically interfacility transportation. This view of the boundary object does not include all of the care EMS provides to *prevent* transport of patients, such as that rendered at mass gatherings and special events, mobile integrated health (MIH) and community paramedic care, law enforcement support and fire rehabilitation care, for which there is no reimbursement.[252]

A supported, robust national EMS system contributes to the National Preparedness Goal in the mitigation, response and recovery mission areas as well as the response mission area. EMS' success in these mission areas is inextricably linked to its success in daily operations. EMS can mitigate the loss of life directly through its capabilities, and through appropriate use of and coordination with scarce healthcare system resources. Through these capabilities, EMS can also assist in maintaining the healthcare system's ability to surge, lessening the impact of future disasters. In the area of response, EMS lives at the margin of its ability to surge.

Clearly articulated capabilities make many of the processes in the national preparedness system possible. They allow for the identification of gaps between actual and target levels of capability, measurement of preparedness levels, and are part of risk-based planning. The OHEMS system in Denver counts among its capabilities, to preserve healthcare system capacity, to equitably distribute patients across the region, and to

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251. National Academies of Sciences, Engineering, and Medicine. *A National Trauma Care System*; National EMS Advisory Council. *002-FIN-07-FINAL* (Washington, DC: National Highway Traffic Safety Administration).

252. "Operational Templates and Guidance for EMS Mass Incident Deployment," FEMA. Accessed www.usfa.fema.gov/downloads/pdf/publications/templates_guidance_ems_mass_incident_deployment.pdf, 25.

coordinate with public and environmental health, and emergency management. Capabilities such as these could be commonplace in federal doctrine. To identify these and other EMS capabilities, to grow EMS capacity and to develop new capabilities will require leadership and a mechanism for fiscal agency, which are both currently lacking.

As a component of the ESS, it should be DHS' responsibility, as the SSA, to foster EMS resilience as part of the ESS. This is echoed in PPD-8: "The Secretary of Homeland Security is responsible for coordinating the domestic all-hazards preparedness efforts of all executive departments and agencies, in consultation with State, local, tribal, and territorial governments, nongovernmental organizations, private-sector partners, and the general public and for developing the national preparedness goal."[253]

Although EMS personnel will be the first to respond in disasters with the other partners in the ESS, they are the least prepared component of community response teams, receiving the least training, funding, and inclusion in preparedness policy creation.[254] As of the date of publication for this thesis, there is no national policy requiring the delivery of EMS services, leaving states to this mandate, if they choose to at all. According to the National Highway Transportation Safety Administration, the U.S. federal agency that has provided the most support for EMS in the past thirty plus years since the repeal of the EMSSA, only four states—North Carolina, California, Oregon, and Colorado, have taken steps to ensure EMS delivery.[255] Even these policy efforts, however, are weakly worded and speak more to the classification of EMS providers as "essential personnel," than they do to require the delivery of services that these "essential personnel" provide.

The lack of a lead federal agency for EMS to serve as the policy point of entry has practical implications. The diffusion of leadership in the EMS policy space is evident in the FICEMS coordination model, and the "claims" of EMS in DHS and HHS, without associated responsibility or funding, leave EMS like a ship without a rudder. While the NHTSA EMS office has done an admirable job keeping the ship afloat with no money or

253. Obama, National Preparedness.

254. Institute of Medicine, Emergency Medical Services, 4.

255. Van Milligan et al., An Analysis of Prehospital Emergency Medical Services, 11.

authority, building capacity and resilience, and developing and supporting clearly defined capabilities is far away on the horizon.

VI. CONCLUSION AND RECOMMENDATIONS

> "People do not unearth facts, but, rather, assemble, array, propose and defend them from their situations."[256]
>
> —Susan Leigh Star

A. EMS IS A BOUNDARY OBJECT

Consistent with the characteristics of a boundary object, EMS provides for targeted cooperative work across different communities of practice and disciplines.[257] The ability for such broad and diverse groups of stakeholders to work in the EMS space without rigid definitions of what EMS is and what it can, does or should do, is a potential benefit at local levels, as it accounts for local perceptions and resources.

The historical development of EMS in the United States reflects the emergence of a boundary object through the cooperative work of people and groups of actors. Similar to the MVZ example in Star and Griesemer seminal paper on boundary objects, the success of which depended upon the successful collaboration of amateurs, professionals, and members of multiple communities of practice, EMS systems are the result of collaborative work of such groups. The particular set of problems that these collaborators were trying to solve, identified in the 1966 "White Paper"[258] garnered enough public and political attention to drive action, and the resulting cooperative work employed the same (and potentially other) management tools that made the MVZ successful—methods standardization and boundary objects.[259]

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256. Susan Leigh Star, "Cooperation without Consensus in Scientific Problem Solving: Dynamics of Closure in Open Systems," in *CSCW: Cooperation or Conflict*, (New York: Springer, 1993), 94.

257. Star, "This is Not a Boundary Object, 604-05.

258. National Academy of Sciences and National Research Council Committee on Shock, *Accidental Death and Disability.* The report is commonly referred to by EMS adherents as "The White Paper," as it is credited with birthing modern EMS.

259. National Academy of Sciences and National Research Council Committee on Shock,; Star and Griesemer, "Translations and Boundary Objects," 392-93.

That EMS, even as a term, defies consistent definition supports my hypothesis that it is a boundary object. That EMS looks different from one community to another does as well. The EMS system in Denver looks much different than even its neighboring jurisdictions, but this has not prevented inter-jurisdictional EMS work or planning. The actors operating within the boundary object do not have consensus about what EMS is and how to deliver it, but its outputs—responding, happens hundreds of times a day for a trusting public. While there are differences between EMS systems and agencies, there are also similarities.

The methods standardization in the early EMS case were the fifteen system design element requirements for federal funding, found in the EMSSA.[260] While these critical components were contingencies for the funding, they did not dictate the methods of interaction between requisite component parts at the local level. The resulting systems, emerging from the actors involved, were plastic enough to meet both the local expectations and definitions, but robust enough to meet the federal definitions of EMS systems.[261]

The resulting EMS systems initially reflected the EMSSA's methods standardization and the cooperative work of multiple communities of practice at the local level. HEW and DOT bolstered these efforts through federal funding and policy leadership, leaving the interpretations and implementations to the local actors, who could "tack back-and-forth" between the local and global interpretations of the EMS object, another characteristic of boundary objects.

Bowker and Star, Star and Ruhleder, and later Star, in her 2010 reflections on the scaling question, proposed the idea of "boundary infrastructure."[262] Over time, the local interpretations of objects arising from cooperative work across multiple communities of

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260. Emergency Medical Services Systems Act. The EMSSA dictates fifteen specific components of an EMS system, that include structures, infrastructure and activities of the system. These were the methods standardization for EMS systems, analogous to Grinnell's specimen collection and curation guidelines in the MVZ example.

261. Bowker and Star. *Sorting Things Out,* 297.

262. Bowker and Star; "Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces," *Information Systems Research* 7, no. 1 (1996); Star, "This is Not a Boundary Object," Star, "This is Not a Boundary Object."

practice, become their own structures. Star and Bowker refer to the "parts that are sunk into the built environment are called here boundary infrastructures—objects that cross larger levels of scale than boundary objects."[263]

Looking at EMS at the local level, Perhaps the EMS object is no longer, and that it has become so naturalized in its local forms, that the situated meanings of EMS—the natures of the work, and the contingencies that created the object, are no longer required to keep it coherent.[264] Just as we no longer think anything of the light coming on when we turn on the switch, or the light in a refrigerator coming on when we open the door, perhaps the EMS boundary object as sunk into the infrastructure of our lives.[265] Star and Bowker recognized this phenomenon as the "naturalization" of objects in communities.[266] Within the OHEMS community of practice, particularly at local scale interpretations of the EMS object, it may be experiencing the same.

If this is the case, then the iterative negotiations of meaning and translations between communities of practices and allies is no longer necessary. Perhaps this is among the reasons for the lack of urgency to tackle the *same continuing* problems that drove the initial efforts to build EMS systems and ensure equitable care across communities. Naturalized objects "become a form of collective forgetting, or naturalization, of the contingent, messy work they replace."[267] The work of building EMS systems was messy, as was the problem the work intended to address. What might spark our collective imaginations, to remind ourselves of the contexts where EMS is not naturalized, is an area for future study.

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263. Bowker and Star, 287.

264. Bowker and Star*,* 299.

265. Star, "This is Not a Boundary Object," 611. Star identifies one characteristic of infrastructure is its "embeddedness" in other structures, social arrangements and technologies. I gratefully attribute the light switch and refrigerator analogies to Carolyn Halladay and Lauren Wollman respectively, who acted as wonderful sounding boards for the idea of EMS as boundary object.

266. Bowker and Star. *Sorting Things Out,* 299.

267. Bowker and Star.

B. EMS VAGARIES PREVENT COHERENT NATIONAL PREPAREDNESS POLICY

The global EMS object became "fuzzier" in 1981 with the repeal of the EMSSA with the 1981 COBRA. This removed the carrot of federal funding to subscribe to the methods standardization that the EMSSA's system requirements, leaving the actors within local EMS systems to develop local boundary objects that may or may not scale up to the global object. Since national preparedness policy makers are typically concerned with larger scales, this may be the cause of some of the misalignment of preparedness policy with local interpretations of EMS.

Another important outcome of the repeal of the EMSSA was the loss of federal leadership for EMS. As an analog to the MVZ example, it would be like Grinnell quitting and leaving the MVZ. His legacy would certainly continue to shape the MVZ, but his leadership in ensuring adherence to the strict collection and curation standards and communicating their importance to the other actors in the collaborative efforts would be sorely missed. EMS is missing its Grinnell, its methods standardization, and a currency for participation in the *global* EMS boundary object endeavor.

I am convinced that OHEMS' role in preparedness policy is shaped by various forces, including multiple perspectives, history, and incoherent translations at scale, from the local to the global. This lack of coherence makes meaningful preparedness planning challenging. The absence of federal leadership contributes to this lack of coherence, as does the current policy. The literature about the implications of a lack of federal leadership for EMS seems to broadly agree that there is a lack of coordination of effort and representation for EMS at the federal level, and that this condition has negative implications. Most of the research is consistent in describing the state of EMS in the nation as "fragmented," and the majority recommends some remedy to the stated problem.[268] Parochial and political interests about EMS oversight exist, and there is not consensus

268. Institute of Medicine, *Emergency Medical Services;* Philip P. McGovern III, "Creation of a United States Emergency Medical Services Administration Within the Department of Homeland Security" (master's thesis, Naval Postgraduate School, 2012); Pratt et al., *Prehospital 9-1-1*; Leeanna Mims, "Improving Emergency Medical Services (EMS) in the United States through Improved and Centralized Federal Coordination" (master's thesis, Naval Postgraduate School, 2011) are examples.

about what EMS oversight might look like, and from where it would come. There are essentially four camps with fairly specific recommendations for EMS oversight. The camps are:

1. EMS oversight and support through creation of a United States EMS Administration in DHS[269]

2. EMS oversight and support through creation of a United States EMS Administration in HHS[270]

3. EMS oversight and support through augmentation of the existing Office of EMS in the National Highway Traffic Safety Administration

4. The status quo, with no creation or augmentation of federal EMS entities[271]

Generally, the literature points to the need for a lead federal agency to oversee and provide for EMS. A notable holdout, however, is found with the International Association of Firefighters (IAFF). In a letter to then Secretary of DHS, the IAFF advocated for the status quo, rather than a lead federal agency.[272] The other camps' advocates recommend the designation of a lead federal agency in DHS, HHS or NHTSA.

The DHS and HHS camps advocate for the creation of a United States EMS Administration that would be designated as the lead federal agency for EMS, with the funding and authority to meet the mission. The NHTSA camp seems reticent to relinquish control of neither the national standard curriculum for EMS, which it developed, nor its

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269. McGovern; IAEMSC, Consolidated Federal Leadership for Emergency Medical Services: An Essential Step to Improve National Preparedness: A Perspective from EMS on the Front Line (Washington, DC: IAEMSC, 2010); Cilluffo, Kaniewski, and Maniscalco, "Back to the Future,"

270. Mims, "Improving Emergency Medical Services," A federal home for EMS has been recommended in numerous reports as well, including the Institute of Medicine's *EMS at the Crossroads* and NHTSA's "EMS Agenda for the Future," acknowledging its role as part of the healthcare system as well as the emergency response system.

271. International Association of Fire Fighters, "Letter to DHS Secretary Michael Chertoff from IAFF," Fire Engineering. May 23, 2005, https://www.fireengineering.com/articles/2005/06/iaff-opposes-creation-of-separate-ems-administration.html.

272. "Letter to DHS Secretary Michael Chertoff from IAFF,"

other creation, the National EMS Information System (NEMSIS). The NHTSA office of EMS, however, has a narrower mission than most EMS agencies in the country, with the mandate to reduce accidental death and disability on America's roadways.

While this mission was, and continues to be in the EMS realm, it is only a portion of EMS' responsibilities in out of hospital emergency medical care. The evolution of EMS has led to the need for administrative support that goes far beyond an office in NHTSA with a budget that amounts to a rounding error on the DOT budget.[273] Other than recipients of the small grants that the NHTSA EMS offers as patronage for project work, none of the literature demonstrates support for NHTSA as a lead federal agency for EMS oversight and support. In fact, most of the little research available purports that EMS has evolved beyond being merely a transportation resource and beyond NHTSA.

More coherent preparedness policy will benefit from the incorporation of OHEMS' situated knowledge. The support for OHEMS in national preparedness, and the development of reliable capabilities for response needs to correspond with the actual needs and capabilities of the OHEMS community of practice, rather than "abstract expectations."[274] And, as Brown and Duguid claim, "what those needs are can only be understood by understanding the details and sophistications of actual practice."[275] A point of entry into the federal government in the form of a lead agency would serve to advocate, support and establish the methods for building and supporting OHEMS capabilities, improving the coherence between local and policy interpretations of the EMS boundary object.

The vague federal definition, the absence of a lead federal agency (the EMS Grinnell), and the lack of methodological standardization are problematic for EMS capability and capacity in the national preparedness sense. They leave EMS as a commoditized transportation resource, a local boundary object interpretation that may

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273. "NHTSA Budget Information," NHTSA, accessed May 21, 2015. http://www.nhtsa.gov/Laws+&+Regulations/NHTSA+Budget+Information.

274. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 106.

275. Brown and Duguid.

scale from the local to the national levels, but certainly undersells what OHEMS *could* do to improve national preparedness.[276]

Even assuming that it would scale from its local interpretations, the nation is still in the position of pre and post-hoc finger pointing between federal agencies about responsibility for EMS. The three major federal players—DOT, specifically NHTSA, has historic roots in EMS that the discipline has outgrown; DHS is the lead agency over the ESS as part of CIKR, but has assumed little responsibility for, or authority over OHEMS, nor has HHS, the lead agency for ESF-8 and the public health, healthcare and emergency medical services core capability.[277]

Federal leadership, consolidated to one agency with responsibility, authority and appropriate funding for EMS does not have to represent what Star describes as a "brute force solution," a top-down authoritarian approach to EMS oversight, but rather acts as a facilitating actor, as Grinnell was in the MVZ.[278] A lead agency would serve as a policy entry point, through which local communities of practice could interact with the federal government, a fiscal agent for building and growing EMS capacity, and the agency through which a collaborative methods standardization could occur. I hope that *action,* not further research and study, will continue in this area. This problem has been well documented and the recommendation to establish a lead federal agency for EMS has been in reports and testimony for decades.[279]

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276. e.g., see: Malcolm Kemp, "Expanding the Role of Emergency Medical Services in Homeland Security" (master's thesis, Naval Postgraduate School, 2013); James Morrissey, "Strategies for the Integration of Medical and Health Representation within Law Enforcement Intelligence Fusion Centers" (master's thesis, Naval Postgraduate School, 2007); and Michael Petrie, "The Use of EMS Personnel As Intelligence Sensors: Critical Issues And Recommended Practices" (master's thesis, Naval Postgraduate School, 2007), as examples.

277. There are multiple reports and theses that advocate for federal leadership for EMS. Uniformly, they acknowledge the efforts of the DOT and the NHTSA Office of EMS, but consistently advocate for the locus of EMS responsibility and authority to reside in either HHS or DHS. e.g. see Cilluffo, Kaniewski, and Maniscalco, "Back to the Future;" IAEMSC, *Consolidated Federal Leadership for EMS;* Mims, "Improving Emergency Medical Services"; and McGovern, "Creation of a United States EMS Administration," as some examples.

278. Cilluffo, Kaniewski, and Maniscalco, "Back to the Future," 14. See also IAEMSC, *Consolidated Federal Leadership for Emergency Medical Services*, 15-16; Star, "This Is Not a Boundary Object," 609.

279. Institute of Medicine, *Emergency Medical Services*, 6-7. See also NHTSA, "EMS Agenda for the Future," 13.

C. MULTIPLE COMMUNITIES OF PRACTICE OPERATE WITHIN, WITH AND AROUND EMS

As Bowker and Star assert, "We are all in this sense, members of various social worlds—communities of practice—that conduct activities together. Membership in such groups is a complex process, varying in speed and ease, with how optional it is and how permanent it may be."[280]In EMS, there are multiple communities of practice interacting and cooperating at all levels of scale—from the very local to the federal policy level.

At the local level, these communities of practice include the public, policy makers, emergency operators, nurses, paramedics, and more. One need look no further than the FICEMS[281] membership agencies to see the multiple communities of practice in the federal interagency EMS space. As in the MVZ, each of these communities of practice interpret the EMS object their own ways, and translate its meaning to respective members, maintaining the local meanings within the communities, as well as coherence around the broader object.[282]

One community of practice that emerged from the growth and development of EMS systems across the country is that of the out of hospital EMS provider. The recognized need for emergency care in addition to transportation, reflected the valued contributions of expert opinions and the acquired scientific and working knowledge of physicians who claim the domain of medicine. Over the years since the enactment of the EMSSA, however, the OHEMS community of practice has grown, evolved, and formulated its own perceptions of the EMS object, at the local and global levels, which creates "tension" between it and other communities of practice that necessitates negotiation at a boundary.[283]

Appraising the relative value of different types of knowledge is beyond the scope of this thesis, as is how to incorporate all types of knowledge into the process of crafting

280. Bowker and Star. *Sorting Things Out*, 294.

281. EMS, "Federal Interagency Committee on EMS,"

282. Star and Griesemer, "Translations and Boundary Objects," 390-91.

283. Star and Griesemer, 410. See also, Carlile, "A Pragmatic View,"448, 453.

preparedness policy. However, the history of EMS system development shows that expert opinion and academic knowledge are highly valued in these activities, creating a power dynamic between "white collar" and "blue collar" knowledge. The evolution of EMS systems began with taking academic medical principles out of universities and hospitals, into the field.

The evolution of OHEMS *providers* from "ambulance drivers" and "ambulance attendants" to emergency medical care providers has entailed a standardization of medical practice and education that has been driven by physicians—the "experts" in medical care. This is perhaps an unresolved conflict between communities of practice operating within the EMS boundary object. Physicians have their own perceptions of the practice of medicine as a boundary object as well. OHEMS providers are what Lave and Wenger would consider legitimate peripheral participants in the medical community of practice, performing many of the same assessments and treatments as emergency physicians, without full membership in the community of practice.[284]

Star and Griesemer recognized the role of entrepreneurs defending a particular interpretation of the boundary object in which they are participating, so that it is not displaced, and physicians can, and do defend their domain. Since in the current United States structures for the out of hospital EMS *medical practice*, OHEMS practice under the model of delegated practice—that is under the oversight of physicians, there is another power dynamic at play. Liberati et al found a similar dynamic between physicians and nurses in their study of multidisciplinary medical teams in hospitals. They found the institutional power dynamic to be a challenge to effectively merging physicians and nurses into teams.[285]

Physicians establish and approve OHEMS protocols based on their interpretations of the translation of the boundary object that is the practice of medicine, to the field. The American College of Emergency Physicians released a policy statement in 2017, asserting

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284. Lave and Wenger. *Situated Learning*.

285. Elisa Giulia Liberati, Mara Gorli, and Giuseppe Scaratti, "Invisible Walls within Multidisciplinary Teams: Disciplinary Boundaries and Their Effects on Integrated Care," *Social Science & Medicine* 150 (2016): 31–39. https://doi.org/10.1016/j.socscimed.2015.12.002.

the community of practice's roles in *directing* OHEMS personnel, operations, system design, communications and credentialing, to include "ultimate clinical authority."[286] Physician developed, written protocols are what Brown and Duguid refer to as canonical practices—written practices intended to standardize OHEMS practice.

In Orr's ethnographic work, upon which Brown and Duguid built, the organization (the copier company) intended to provide a "map" of decision trees for the technicians to follow to resolve problems with the machines, based on a canonical description of problem codes and issues that they would encounter in the field.[287] The canonical practice effectively "downskilled" the repair technicians' practices to "if, then" checklists and decision trees.[288] Written OHEMS protocols act as the same type of canonical objects, distilling OHEMS providers' practice of medicine to a "set of simple, Tayloristic, canonical steps that can be followed without need of significant understanding or insight (and thus without need of significant investment in training)" in this case, formal higher education.[289] Whatever the reasons for the current practice model, the resulting consequences are that "the intent to downskill may first drive noncanonical practice and communities yet further underground so that the insights gained through work are more completely hidden…."[290]

Throughout the history of OHEMS, *patient care* data collected from, and used to inform out of hospital medical practice come from the (battle)field, and are typically collected, analyzed and published by physicians and academicians as activities in the *science* of medicine, rather than by the people collecting them. In this sense, OHEMS providers act as the *data conduits* for physicians and academics for often retrospective data,

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286. "The Role of the Physician Medical Director in Emergency Medical Services Leadership," AECP, accessed August 25, 2018. http://www.acep.org/patient-care/policy-statements/the-role-of-the-physician-medical-director-in-emergency-medical-services-leadership/.

287. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 101-02.

288. Brown and Duguid, 101-06.

289. Brown and Duguid, 101-02. Brown and Duguid's analysis of "downskilling" used the example of Orr's ethnographic work studying copy machine technicians, and the end ellipsis replaced "or skilled technicians," I did not include the word in the reference to avoid confusion about whether I was referring to EMTs or copier technicians.

290. Brown and Duguid, 116.

abstracted from the experience of caring for the patients in environments with uncontrolled temperatures, lighting, weather and safety. This has potential negative clinical medical consequences.[291] It is important as an evolution of OHEMS' ability to translate meaning to other communities of practice, that it recognizes the currency of data, and its value.

Star, in her study of neuroscience, discovered in the margins of observation checklists sent home with seizure patients and their families, "a wealth of information...discarded as unimportant."[292] The families and patients themselves were acting as "research assistants" to the physician.[293] Star recognized, "the problem of collecting, disciplining, and coordinating distributed knowledge" in her studies; a problem for OHEMS and its growth as a discipline. For OHEMS, to achieve its status as a discipline, needs to study what it is and does, and create its own body of knowledge across its organizational, operational and medical practices. This will likely require the same translation, simplification, triangulation and negotiation between actors in the EMS boundary object that actors in the MVZ had to employ to make that endeavor successful.[294]

According to Dillon, "Knowledge becomes structured in disciplines, and creativity becomes synonymous with productive work within a discipline."[295] The knowledge comes from creative activity within a discipline and it can be acquired, practiced and transmitted to others through creating together, as with the situated knowledge Lave and Wenger, and subsequent authors describe.[296] More OHEMS academicians to create, study and transmit OHEMS knowledge would increase OHEMS' opportunities to collaborate in meaningful work and to act as translators of meaning from its community of practice to others through multiple memberships (i.e. OHEMS and academia).

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291. Institute of Medicine, *Emergency Medical Services,* 4.

292. Star, "This is Not a Boundary Object," 607.

293. Star.

294. Star and Griesemer, "Translations and Boundary Objects," 389.

295. Patrick Dillon, "A Pedagogy of Connection and Boundary Crossings: Methodological and Epistemological Transactions in Working across and between Disciplines," *Innovations in Education and Teaching International* 45, no. 3 (2008), 256.

296. Dillon, 256.

The "technician" categorization for OHEMS personnel is an historic artifact from early EMS boundary object work, that persists with the consequences of marginalizing OHEMS providers as "others" and "outsiders" in the medical community, as Star recognizes as a consequence of categorizing (see Figure 4).[297]

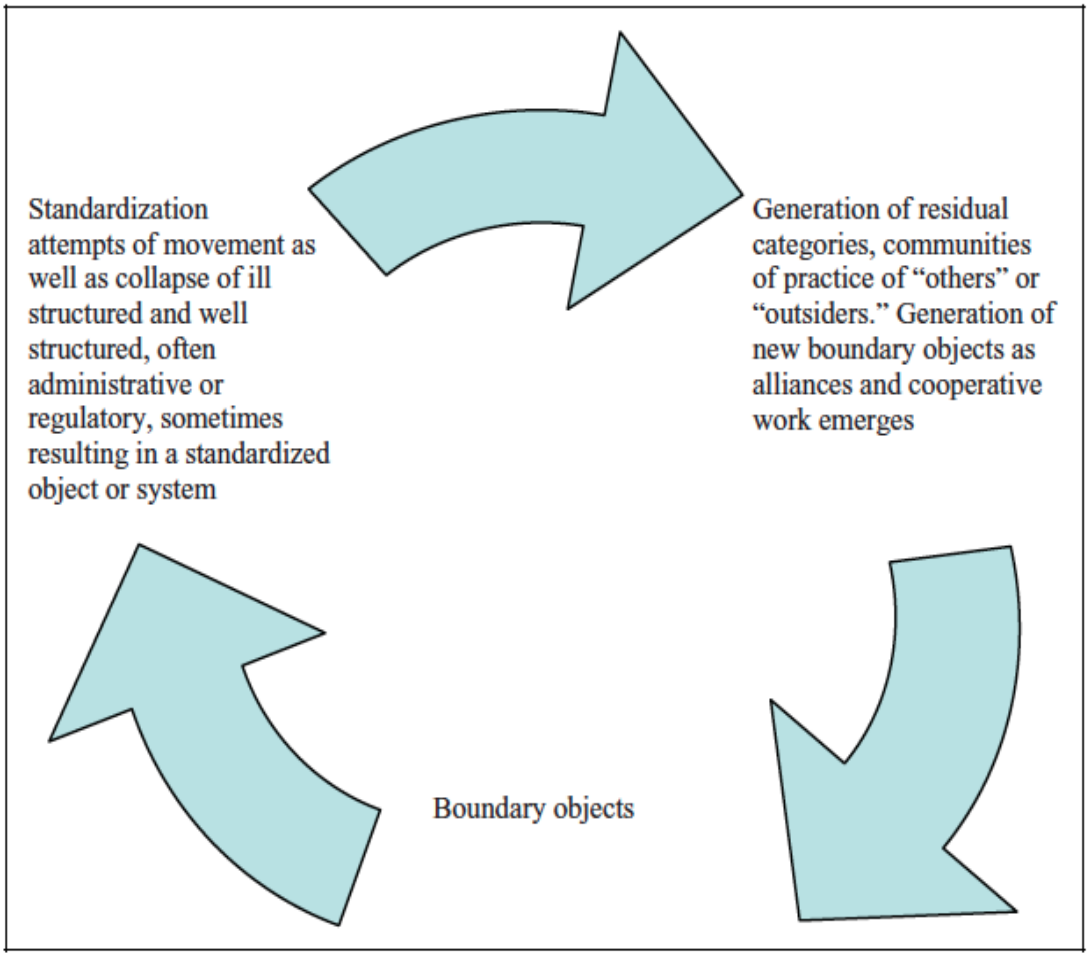

Figure 4. Relationships between Standards and Residual Categories[298]

Just as in the example of the copy machine technicians, the repair technicians developed into a community of practice, so have OHEMS providers. It may be the attempts

297. Star, "This is Not a Boundary Object," 613-15.

298. Source: Star, 615.

to standardize practices through standardized EMS national standard curricula and written medical and protocols that have created it (Figure 4). It is possible that specifically, between the medical community of practice and the OHEMS community of practice that has emerged since the birth of organized EMS, that the communities are not cooperating in a boundary object at all. Star and Griesemer recognized other means "of satisfying these potentially conflicting sets of concerns. Other means include imperialist imposition of representations, coercion, silencing and fragmentation."[299] These are other areas for further EMS research and discursive engagement.

D. OUT OF HOSPITAL EMS NEEDS A DOMAIN

Defining EMS is not a trivial exercise. It has significant implications in bounding domains, clarifying the personnel, equipment, and arrangement of them, and in determining what constitutes the current and future discipline and profession that is OHEMS. While it is a community of practice, having all of the characteristics of Wenger's definition, in preparedness policy doctrine, it is a nebulous component of the *system* of care that is EMS, often relegated to its historic role as a mere transportation commodity.[300] This vagueness is a detriment to the men and women providing emergency care in the field. In Bechky's study of a manufacturing firm, she identified that tangible definitions could themselves, "serve as boundary objects between groups, creating the common ground that leads to shared understandings."[301] She also recognizes pitfalls of such an approach, particularly if the definitions are abstracted from the social relationships and work contexts they mean to describe.[302]

Various professional groups have their own definitions of EMS and claim their own stakes in it. These include physician groups, private ambulance lobbies, firefighters, aeromedical providers and others. There are clear parochial interests among these groups

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299. Star and Griesemer, "Translations and Boundary Objects," 413.

300. Joanne, "Limits to Communities of Practice," 625. Roberts, in her paper, has a comprehensive compilation of community of practice characteristics, synthesized from Wenger's works.

301. Bechky, "Sharing Meaning," 312-330.

302. Bechky, 326.

as part of the EMS *system,* that align with functional EMS roles as part of the healthcare system, part of the public health system, part of the medical system and part of the public safety system.

The broad object of EMS, particularly in preparedness, is inclusive, incorporating the full spectrum of emergency medical care, public health, and public safety. In the effort to establish the community of practice that is the OHEMS provider community as a discipline, it is logical to more clearly define its domain. I have referred to this domain as OHEMS rather than prehospital care, to which it is often referred, because of the implication of the continuation of care in a hospital, which is not always the case. Most of the care OHEMS provides occurs outside of medical care facilities in homes, public places, roadways, public venues, on battlefields and other places.

The OHEMS "discipline" has evolved even since the 2001 National EMS Research Agenda, which defined EMS in "the more traditional, colloquial meaning: prehospital health care for patients with real or perceived emergencies from the time point of emergency telephone access until arrival and transfer of care to the hospital."[303] In practice, OHEMS providers have overlapping responsibilities as part of the public health, the public safety and the medical community. They provide out of hospital medical treatment, impact public health in morbidity and mortality rates, and are the third leg of the public safety emergency response system, along with law enforcement and firefighting.[304] While OHEMS is often associated with the other emergency responders in the emergency services sector, it has a foot squarely in the healthcare space as well. The services it provides are medical services.

Assuming all of the above, OHEMS then, is the *out of hospital, or field* component of the intersection of the public safety, public health and medical community. This description, depicted graphically, may look like Figure 5, with each circle representing a

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303. Michael R. Sayre, Lynn J. White, Lawrence H. Brown, Susan D. McHenry, and National EMS Research Agenda Writing Team, "National EMS Research Agenda," *Prehospital Emergency Care* 6, no. 3 Suppl. (2001): S1-43.

304. National Highway Traffic Safety Administration, "EMS Makes a Difference: Improved Clinical Outcomes and Downstream Healthcare Savings. A Position Statement of the National EMS Advisory Council1," *Annals of Emergency Medicine* 57, no. 2 (2011): 169.

domain and the various professions and communities of practice operating within it.[305] Just as Brown and Duguid describe organizations as "communities of communities of practice," the broader boundary object endeavor of EMS reflects this.[306] Out of hospital EMS providers have peripheral participation in all of these communities of practice, in addition to their operational roles and responsibilities in each.

The intersection of the three, public health, public safety, and the medical community, represents the EMS discipline and professions within it. The area within the black triangle represents the field (out of hospital/facility, and not necessarily emergency) response domain of each of the broader disciplines. There are legitimate operational partnerships between the communities of practice outside of their buildings and offices in the communities they serve. The blue triangle represents the out of hospital, or the OHEMS domain. I consider OHEMS claiming a domain, a critical component of establishing OHEMS as a discipline.

305. Institute of Medicine, *Emergency Medical Services,* 40. This figure, created by the author, is an adaptation of the figure.

306. Brown and Duguid, "Organizational Learning and Communities of Practice," (2000), 116.

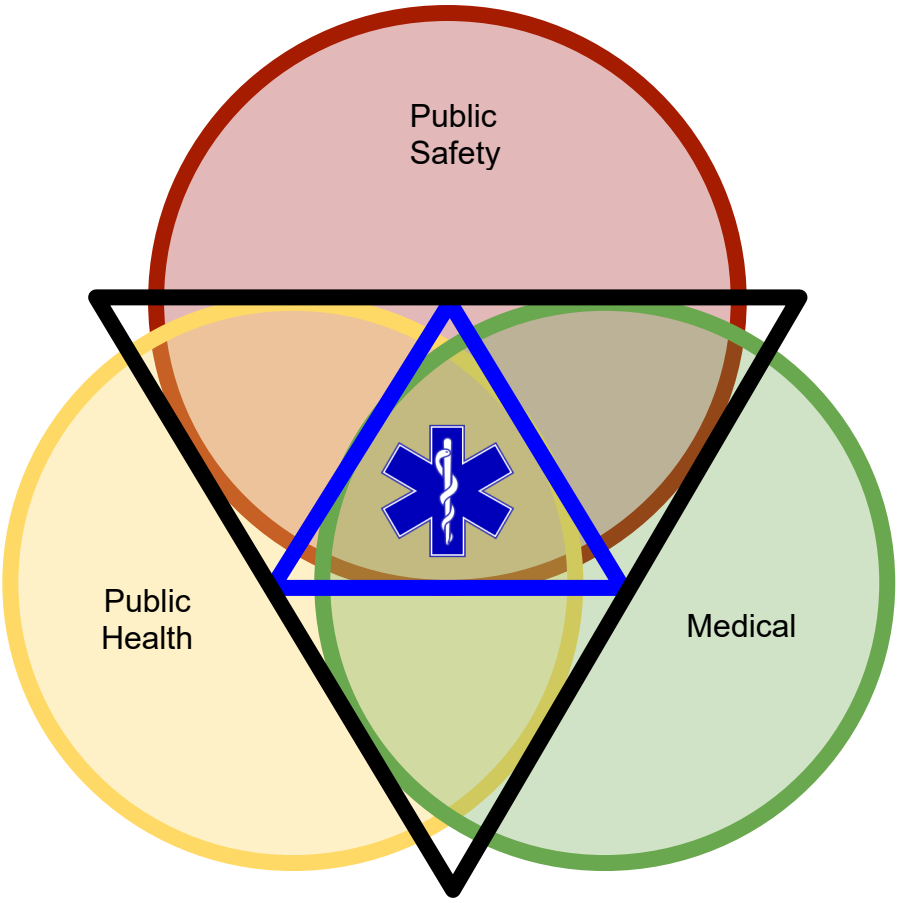

Figure 5. The Out of Hospital EMS Domain[307]

The National Emergency Medical Services Managers Association (NEMSMA) issued a position statement on this subject, in its "Call for Common Nomenclature for the Profession of Paramedicine,"[308] in 2017. The position statement calls for a name for the discipline and profession for out of hospital providers, and claims "out of hospital" as its domain. Specifically:

> It is the position of the National EMS Management Association that government and industry alike recognize the term "paramedicine" to describe the discipline and profession within which traditional prehospital

307. Adapted from EMS, "What Is EMS?"

308. "Call for Common Nomenclature for the Profession of Paramedicine," National Emergency Medical Services Managers Association. April 10, 2017, https://www.nemsma.org/images/pdfs/Position-Paper-Paramedicine-Nomemclature-Final.pdf.

> medicine is performed. Paramedicine is the medicine provided by out-of-hospital providers that are licensed as EMS providers, medical transportation services, community paramedics, etc. Furthermore, we believe the term "paramedic" should become the standard reference to all individual providers.[309]

This domain is descriptive, and defines the venues in which and types of activities the community of practice participates. It provides a definition with which governmental entities and cooperating groups can interact. This may not be the final domain or definitions, as those might require more debate, simplification, triangulation and negotiation, but it is a start and is an area for continued research and effort.

E. TRANSLATIONS OF LOCAL EMS OBJECTS DO NOT SCALE TO NATIONAL PREPAREDNESS POLICY, RESULTING IN MISALIGNED POLICY

The process for national preparedness policy development is beyond the scope of this thesis, but the situational learning and communities of practice literature recognize a hierarchy of preferred knowledge in organizations, the government being one, typically prioritizing expert knowledge over the tacit. This preference is evidenced by the sheer number of consulting firms and lobbyists in the national's capital, and the amount of money these firms earn for providing expertise.

National preparedness policy does have a public process for input, but the broader OHEMS discipline lacks a unified voice, a definition, or a domain through which to influence policy. It also does not have a federal policy entry point or advocate in the form of a lead agency with responsibility for the discipline. The boundary object interpretation at local levels of scale arose from cooperative work—from the "artful juggling, gestalt switching, and on the spot translating, that Star and Bowker describe."[310] It is not clear whether the asynchronous public comment collection processes provide a venue for these tools of shared meaning to function.

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309. National Emergency Medical Services Managers Association

310. Bowker and Star. *Sorting Things Out*, 292.

As Star identified in her 2010 reflections on boundary objects, they have become synonymous with interpretive flexibility.[311] Structure and scale of boundary objects are other aspects that get far less attention.[312] The materiality that Star ascribes to boundary objects comes from action, and as such, boundary objects may or may not be the best structures for enacting national preparedness policy. At the preparedness policy level of scale, EMS "action" is often notional and interpretive flexibility becomes necessarily lost.

Translations of EMS meaning at the local levels of scale may be difficult to scale to the policy level because it has become what Star refers to as boundary infrastructure at local levels. This is an area for further research, however, at local levels of scale, EMS systems and OHEMS demonstrate many of the characteristics that she and Ruhleder introduced, and which she concisely summarized.[313] These include:

- Embeddedness. Infrastructure is sunk into, inside of, other structures, social arrangements and technologies;
- Transparency. Infrastructure is transparent to use, in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly *supports* those tasks;
- Reach or scope. This may be either spatial or temporal—infrastructure has reach beyond a single event or one-site practice;
- Learned as part of membership. The taken-for-grantedness of artifacts and organizational arrangements is a sine qua non of membership in a community of practice (Lave and Wenger 1991; Star 1996). Strangers and outsiders encounter infrastructure as a target object to be learned about.

311. Star, "This is Not a Boundary Object," 602.

312. Star.

313. Star and Ruhleder, "Steps Toward an Ecology of Infrastructure," 111-32; Star, "This is Not a Boundary Object," 611-12.

New participants acquire a naturalized familiarity with its objects as they become members;

- Links with conventions of practice. Infrastructure both shapes and is shaped by the conventions of a community of practice, for example, the ways that cycles of day–night work are affected by and affect electrical power rates and needs. Generations of typists have learned the QWERTY keyboard; its limitations are inherited by the computer keyboard and then by the design of today's computer furniture (Becker 1988);

- Embodiment of standards. Modified by scope and often by conflicting conventions, infrastructure takes on transparency by plugging into other infrastructures and tools in a standardized fashion.

- Built on an installed base. Infrastructure does not grow de novo; it wrestles with the inertia of the installed base and inherits strengths and limitations from that base. Optical fibers run along old railroad lines; new systems are designed for backward-compatibility; and failing to account for these constraints may be fatal or distorting to new development processes.

- Becomes visible upon breakdown. The normally invisible quality of working infrastructure becomes visible when it breaks: the server is down, the bridge washes out, there is a power blackout. Even when there are back-up mechanisms or procedures, their existence further highlights the now-visible infrastructure.

- Is fixed in modular increments, not all at once or globally. Because infrastructure is big, layered, and complex, and because it means different

things locally, it is never changed from above. Changes take time and negotiation and adjustment with other aspects of the systems involved.[314]

As someone who has been involved in EMS at multiple levels of scale, and a leader in a local agency, *all* of these characteristics can be found in the Denver Paramedic Division. I have been around and in other local EMS agencies and systems enough to know that my agency is not unique in this regard. So, what does this mean for aligning national EMS policy with local interpretations of the object? If indeed, EMS as a local boundary object, has become part of the infrastructure of our lives, this and the defense of local interpretations would explain their persistence, and the reluctance to change them.[315] Perhaps this is even the reason for the public's relative indifference to the variability in their chances of survival between communities. I sincerely hope this becomes the subject of future research.

An example of a potential method for sparking a resurgence of collective remembering may be found in the process of codesigning.[316] Oswick, et al's analysis of codesign efforts in emergency services in New Zealand, reveal a potential model for a broader public engagement across diverse communities of practice.[317] In their analysis, "codesign affords public involvement, ensuring the public gains a sense of ownership over government decision making," revealing insights into appropriate levels of services, aligning expectations and providing opportunities for stakeholder to create new shared meanings and their translations into new objects.[318] New EMS objects may entail new work processes, functions and opportunities that better allow for scaling from local interpretations to coherent preparedness policy.

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314. Star, "This is Not a Boundary Object," 611. I have incorporated a full quotation from the text from Star's 2010 paper, as her annotations after each boundary infrastructure characteristic provide the reader with valuable context to each, to facilitate rapid perspective without having to access the source document.

315. Star and Griesemer, "Translations and Boundary Objects," 391.

316. Bowker and Star. *Sorting Things Out,* 299.

317. Oswick et al., 73–91. See this analysis for a detailed description of the applied processes of codesign in emergency health services.

318. Oswick et al.,75-76.

It is time for a national dialog about emergency medical services in and among America's communities, rather than in narrow expert policy spaces. A dialog *with* policy makers and the other actors in the EMS "museum." It is a service people expect and we, the OHEMS "others," must ensure our voices are part of the practical and moral discussions about what we are, do and should do in day to day, in preparedness and in catastrophe. Discursive EMS engagement may require a concerted effort to look at the world differently. As one translator of the EMS boundary object in multiple communities of practice, a fresh look is long overdue.[319]

319. Star and Griesemer, "Translations and Boundary Objects," 390.

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