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Fire Based Mobile Integrated Healthcare and Community Paramedicine (MIH & CP) – Data and Resources

FINAL REPORT BY:

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FOREWORD

The concept of Mobile Integrated Healthcare and Community Paramedicine (MIH & CP) has existed for quite some time internationally, but has been less prevalent in the United States. The primary purpose of MIH & CP programs is to provide healthcare services directly to patients on location therefore minimizing trips to the hospital. Fire Departments have typically always responded to medical emergencies, regardless of whether or not a fire has occurred. Many Emergency Medical Services (EMS) rely on Fire Departments to easily reach out to their communities. The main objectives of this project include identifying where mobile integrated healthcare and community paramedicine (MIH & CP) is used in the USA, determine what information is available from those communities, and produce a report to help the NFPA Technical Committee (TC) on Emergency Medical Services (EMS-AAA) develop a document relating to fire-based MIH & CP systems.

The project tasks included:

- Conducting a literature review and preparing a report on the information regarding the best practices in MIH & CP programs (with a focus on fire-based MIH & CP programs in the United States).
- Understanding how existing EMS resources are being used to provide services, through available fire-based case studies.
- Conducting a brief literature review on functioning MIH & CP programs from around the world.
- Identifying resources and reference materials available regarding these functioning programs.

This project was initiated by the Fire Protection Research Foundation (FPRF) as an information gathering effort to support the development of a guidance document related to fire-based MIH & CP systems, primarily conducted through a literature review.

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The Fire Protection Research Foundation plans, manages, and communicates research on a broad range of fire safety issues in collaboration with scientists and laboratories around the world. The Foundation is an affiliate of NFPA.

About the National Fire Protection Association (NFPA)

Founded in 1896, NFPA is a global, nonprofit organization devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards. The association delivers information and knowledge through more than 300 consensus codes and standards, research, training, education, outreach and advocacy; and by partnering with others who share an interest in furthering the NFPA mission. All NFPA codes and standards can be viewed online for free. NFPA's membership totals more than 65,000 individuals around the world.

Keywords: Healthcare, Community, Paramedics, Paramedicine, Primary care, Emergency Medical Services (EMS), Mobile Integrated Healthcare (MIH), Community Paramedicine (CP).

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Executive Summary:

The concept of Mobile Integrated Healthcare and Community Paramedicine (MIH & CP) has been existing for quite some time, but more prevalent in other countries around the world than in the United States. The primary purpose of MIH & CP programs are to provide more healthcare services directly to patients on location and to minimize trips to the hospitals. Ever since the existence of the Fire departments, they have been attending the medical emergencies along with their role in emergency responses. Many EMS services rely on Fire departments in order to easily reach out to the communities. The main objective of this project is to show where mobile integrated healthcare and community paramedicine (MIH & CP) is being used in the USA, what information is available from those communities, and document a report so as to help NFPA technical committee of EMS-AAA develop a document relating to Fire based MIH & CP systems. Information about this value based healthcare practice with a focus on Fire department based programs are collected and reported based on a thorough literature review.

It is realized that plenty of services are offered by MIH & CP programs, including both pre-hospital and post hospital healthcare. MIH & CP programs can be relevant to both rural and urban areas, but these communities have different capabilities and needs. Hence developing, implementing and evaluating these programs for rural and urban areas should be done differently. As the fire departments closely work for and in every community, there is a tremendous opportunity for fire department based MIH & CP programs.

The case studies reviewed in this report indicates that a successful program should capitalize on linkages, collaboration and integration with other health care resources in the community. There is also an opportunity for innovation. With the ever improving technologies, there can be more out of hospital emergency services be provided. One example, which can be explored with technology is the provision of telemedicine consultation and real time dispatch of results from tests. Another integral part of these programs is its evaluation and review of outcomes. It is realized that successful models were launched as pilot programs and then expanded into larger ones. It is important to ensure that programs are ready for evaluation at the right time. Many evaluation or assessment criteria must be repeated at various intervals. Beyond all these, there should be a clear and formalized description and clarification needed on the expanded role of paramedics/EMTs. Additional training programs for the paramedics are crucial for this to be achieved.

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List of Acronyms

(In the order of appearance in report)

MIH	Mobile Integrated Healthcare
CP	Community Paramedicine
EMS	Emergency Medical Services
ED	Emergency Department
PCP	Primary Care Provider/Physician/Practitioner
EMT	Emergency Medical Technicians
NAEMT	National Association of Emergency Medical Technicians
PCMH	Patient Centered Medical Home
RESP	Rural Expanded Scope of Practice
EMSA	Emergency Medical Services Authority
CCT	Community Care Team, also referred as Critical Care Transport
CHA	Community Health Aides
CHW	Community Health Workers
PCT	Primary Care Technicians
CHAP	Community Health Aide Program
NTHO	Native Tribal Health Organization
CHS	Community Health Specialist
CMMI	Center for Medicare and Medicaid Improvement
NHTSA	National Highway Traffic Safety Administration
HHS	Health and Human Services
CARES	Community Assistance Referral and Education Services
GRFD	Golder Ranch Fire District
CIHP	Community Integrated Healthcare Program
ePCR	Electronic Patient Care Report
RAP	Resource Access Program
SDEMS	San Diego Fire-Rescue department and Rural/Metro Ambulance
DFRF	Dallas Fire Rescue Department
MCHP	Mobile Community Healthcare Program
MFD	McKinney Fire Department
CHP	Community Healthcare Program
BLS	Basic Life Support
TRV	Transitional Response Vehicles
ALS	Advanced Life Support
APP	Advanced Practice Paramedic
SA	South Australia
ECP	Emergency Care Practitioner

GP	General Practitioner
AE	Accidence & Emergency
CREMS	Community Referrals by EMS
EPIC	Emergency Paramedics in the Community

1. Background

The concept of Mobile Integrated Healthcare and Community Paramedicine (MIH & CP) has been existing for quite some time, but more prevalent in other countries around the world than in the United States. The primary purpose of MIH & CP programs are to provide more healthcare services directly to patients on location and to minimize trips to the hospitals. Over the years, Emergency Medical Services (EMS) had focused on serving the community by transporting patients to a hospital emergency department (ED), and the care is provided until care is transitioned to the hospital. The access to healthcare in rural areas is a big challenge which has to be addressed. Rural areas are affected by fragmented healthcare systems, which sometimes lack coordination or resources as a result of being geographically remote. Rural areas are noticed to have poorly resourced primary care services and this population are also less likely to have a regular primary care providers (PCP). According to 2010 National Advisory Committee on Rural Health and Human Services[1], there were only 55 rural primary care physicians for every 10,000 people in rural areas compared to the estimated 95 per 10,000 needed. In other words, this was reiterated in a different way by Wingrove and Laine[2], almost one-fourth of the population in USA lives in rural and remote regions, and only 10% of the physicians practicing in the entire nation serve these areas[2]. MIH & CP programs are developed to identify the potential to transform Emergency Medical Services from a strictly emergency care service to a value based mobile healthcare provider. The fundamental idea of this healthcare model is that patients are not simply treated and discharged; they are treated, managed, and educated[3].

MIH & CP programs should be tailored according to the local community needs, gap analysis and population needs assessment are important in order to develop a valuable program. This is also the reason why they differ from one another in their characteristics. Hence, it is difficult to generalize the findings from one community or state or country to the other. While EMS providers are seen as the bridge to bring healthcare to the community, very few resources exist to guide administrators in this "out-of-hospital" patient care. This forms the motivation for the current project to collect the information regarding the same, with a focus on the different community based programs in general and fire based programs in specific. The interest and attention to this subject area has grown tremendously in the recent years, mainly due to the facts that MIH & CP have improved the access and quality to healthcare at reduced

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[1] National Advisory Committee on Rural Health and Human Services (NACRHHS), **2010 Report to the Secretary: Health and Human Service Issues**. Washington, DC; 2010.
Web: http://www.hrsa.gov/advisorycommittees/rural/2010secretaryreport.pdf

[2] G. Wingrove and S. Laine, **Community Paramedic: A New Expanded EMS Model**. Domain3. 2008 (Fall), p. 32-37.
Web: http://healthandwelfare.idaho.gov/Portals/0/Medical/EMS/NAEMSE_Community_Paramedic_Article.pdf

[3] T. Breyer, **Community Coverage**, NFPA Journal, January-February 2016.
Web: http://www.nfpa.org/newsandpublications/nfpa-journal/2016/january-february-2016/features/community-coverage

costs[4]. *The EMS Agenda for the Future*[5], published in 1996provides a greater vision for "out of facility" EMS and healthcare.

1.1. Objective

Ever since the existence of the Fire departments, they have been attending the medical emergencies along with their role in emergency responses. Many EMS services rely on Fire departments in order to easily reach out to the communities. The main objective of this project is to show where mobile integrated healthcare and community paramedicine (MIH & CP) is being used in the USA, what information is available from those communities, and document a report so as to help NFPA technical committee of EMS-AAA develop a document relating to Fire based MIH & CP systems.

The current project tasks are:

- To conduct a literature review and prepare a report on the information about the best practices in MIH & CP programs, with a focus on the fire based MIH & CP programs in the USA.
- To understand how existing EMS resources are being used to deliver services from available fire based case studies.
- To conduct a brief literature study on the MIH & CP programs functioning around different parts of the world.
- To identify the resources or reference material available on these functioning systems.

This project was initiated at Fire Protection Research Foundation (FPRF) as an information gathering effort to help develop a guidance related to Fire-based MIH & CP systems, through a supporting literature review.

[4] K. W. Kizer, K. Shore, and A. Moulin, **Community Paramedicine: A Promising Model for Integrating Emergency and Primary Care**, July 2013. Web: http://www.emsa.ca.gov/Media/Default/PDF/CPReport.pdf
[5] **EMS Agenda for the future**, NHTSA, 1996. Web: http://www.ems.gov/pdf/2010/EMSAgendaWeb_7-06-10.pdf

2. Introduction

Although Mobile Integrated Healthcare and Community Paramedicine are defined and discussed in similar ways, there are different definitions available. At the same time, each of these programs have some independent characteristic features. The following sections will discuss them briefly, whereas it has to be noted that the information gathered in the other parts of this report are done by combining both these concepts of MIH & CP.

2.1. Mobile Integrated Healthcare (MIH)

In 2014, nine associations came together on a unified vision statement that defines this service delivery model, Mobile Integrated Healthcare (MIH) as *"the provision of healthcare using patient-centered, mobile resources in the out-of-hospital environment"*[6]. It may include, services such as providing telephone advice to 911 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 emergency departments[6].

As reported by Beck et. al.[7], the intention of MIH is to serve a range of patients in the out of hospital settling by providing various services at home for acute, chronic and preventive care. This would improve access to health care through 24 hour availability. This can be ensured by incorporating community partnerships with proper direction. As mentioned earlier, since a MIH program will mostly be unique to a community, a needs analysis is really important to develop a local strategic plan. This will best define how to incorporate existing community resources, services and personnel into a MIH program.

Figure 1 is reproduced from Beck et. al.[7], which gives an overview of the logical model for a MIH program. Any model can be split into four phases – Needs assessment, Inputs and Resources, Activities, and Evaluation. Assessment is usually done through gathering information of the health needs and conducting a health care provider gap analysis on the services provided. The next step is to identify the resources available and the stakeholders. Following this is implementation of the activities which can be provided based on the resources available. Finally an evaluation of the MIH program has be done periodically to understand the results, patient and provider experience, cost effectiveness and the program impact. The most important aspect of an MIH program is that it has to be patient-centered in order to improve the patient outcomes[6]. In general, this patient or community centered care

[6] **Vision Statement on Mobile Integrated Healthcare (MIH) & Community Paramedicine (CP), NAEMT**
Web: https://www.naemt.org/Files/CommunityParamedicineGrid/MIHVision022814.pdf

can be provided by integrating the EMS infrastructure, meet patients where they are and, where feasible, use mobile point-of-care and telecommunications resources[8].

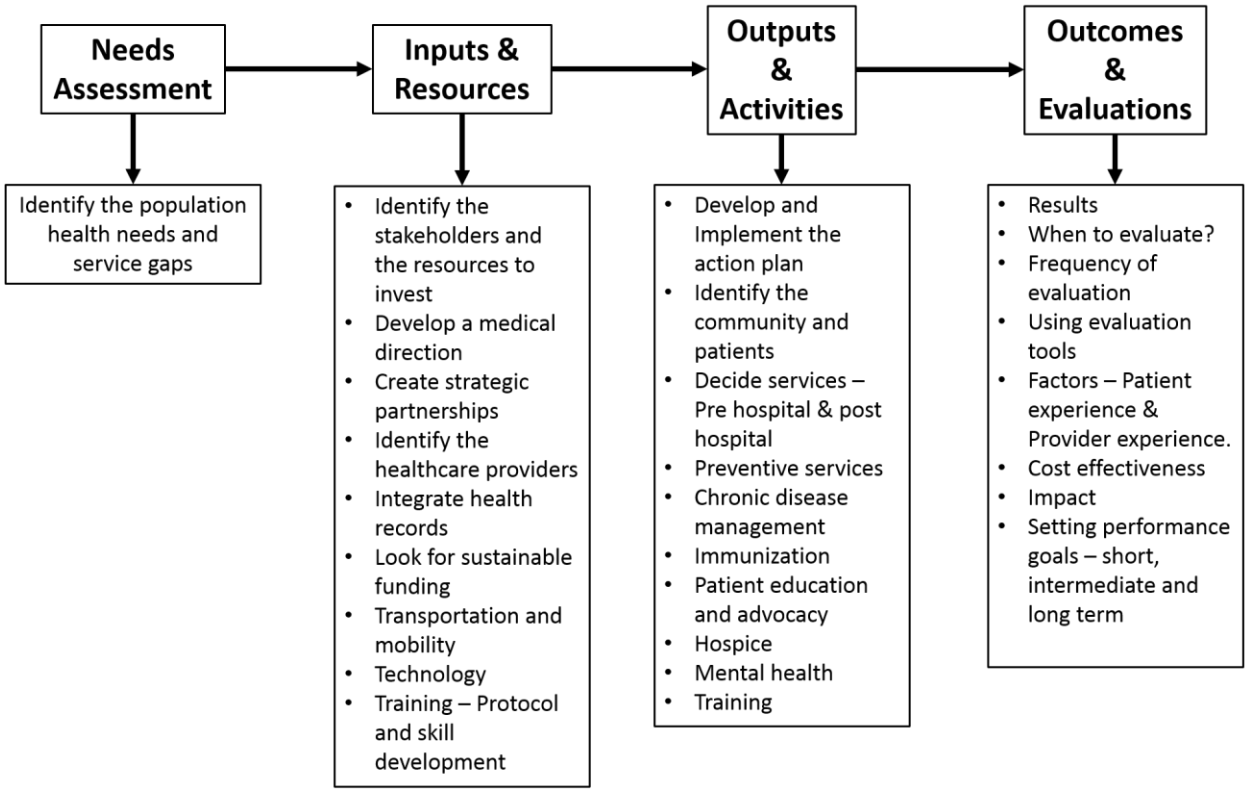

Figure 1: MIH Practice Logic model. Remodeled from Beck et. al[7] .

Development of a MIH program should take into consideration certain aspects of health care[8]. The features of a successful MIH healthcare program should focus on being measurable, scalable, standardized and reproducible on some level. This is critical for the program to be financially sustainable. Some areas of healthcare which has to be focused while developing a MIH program are listed here[8]:

- Post-acute care and Post ED care - readmission prevention and transitional care
- Long term chronic care
- Handling frequent system users

[7] E. Beck, A. Craig, J. Beeson, S. Bourn, J. Goodloe, H. P. Moy, B. Myers, E. Racht, D. Tan, and L. White, **Mobile Integrated Healthcare Practice: A Healthcare Delivery Strategy to Improve Access, Outcomes, and Value** Web: https://www.acep.org/uploadedFiles/ACEP/Practice_Resources/disater_and_EMS/MIHP_whitepaper%20FINAL1.pdf
[8] A. J. Heightman, **Envisioning Community Paramedicine**, Journal of Emergency Medical Services, March 2013. Web: http://www.jems.com/articles/2013/03/envisioning-community-paramedicine.html

- Home-bound, impaired mobility patients
- Health screening
- Public health and prevention
- Patient satisfaction and outcome evaluation

2.2. Community Paramedicine (CP)

Community paramedicine (CP) allows paramedics and emergency medical technicians (EMTs) to operate in expanded roles to provide healthcare services to underserved populations[9]. It is a way to improve rural emergency medical services (EMS) as well as address the healthcare needs of the community.

Community Paramedicine (CP) is a model of community-based health care which can facilitate more appropriate use of emergency care resources and enhance access to primary care[10]. CP programs typically are designed to address specific local problems and in many cases, have demonstrated improved access to quality care and at reduced costs. This is certainly crucial in rural areas, as community paramedics help fill gaps created due to the shortage of primary care physicians and the limited accessibility due to long travel times to closest healthcare[11].

National Consensus Conference on Community Paramedicine[12] described "six C's" for CP which are to be considered while developing any CP model:

- Community - addressing the need
- Complementary - enhancement without duplication
- Collaborative - interdisciplinary practice
- Competence - qualified practitioners and paramedics
- Compassion - respect for individuals
- Credentialed - legal authorization to function

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[9] **Community Paramedicine**. Rural Health Information (RHI) Hub.
Web: https://www.ruralhealthinfo.org/topics/community-paramedicine

[10] **Introduction to Community Paramedicine**, California Emergency Medical Services Authority.
Web: http://www.emsa.ca.gov/Community_Paramedicine

[11] **The Evidence for Community Paramedicine in Rural Areas: State and Local Findings and the Role of the State Flex Program**, Flex Monitoring Team Briefing Paper No. 34, February 2014.
Web: https://www.naemt.org/Files/MobileIntegratedHC/CP%20Policy%20Brief%202.pdf

[12] **National Consensus Conference on Community Paramedicine: Summary of an Expert Meeting**, October 2012.
Web:
http://www.emsa.ca.gov/Media/Default/PDF/National_Consensus_Conference_on_Community%20Paramedicine_Summary_of_an_Expert%20Meeting.pdf

While the community paramedicine approach varies according to the unique needs of each community, it can be broadly categorized into two principal models:

- *The primary health care model*, which focuses on providing services to help prevent hospital readmissions (post-discharge care, monitoring chronic illness, targeting specific high-risk patients); and
- *The community coordination model*, which aims to connect patients to a Patient Centered Medical Home (PCMH). This also include other social and medical services.

According to a recent survey[11] of EMS professionals, community paramedicine programs that emphasize reducing readmissions were identified as one of the most common models in rural areas, with "primary care/physician extender" models most common in the urban areas. But in reality, these models can be effective in both the settings.

As far as a logical model for community paramedicine is concerned, they are mostly anticipated as expanded role of practice models of emergency medical services. O'Meara et. al.[13],[14] focused on developing a Community paramedicine model of care – called Rural Expanded Scope of Practice (RESP) based on data from Australia (2012) and combining the RESP model with the new data from Canada to extend another conceptual basis of CP called RESPIGHT (2016). The RESP model[13] describes paramedics undertaking four broad activities as the core components:

- **R**ural community engagement
- **E**mergency response
- **S**ituated practice
- **P**rimary healthcare

Following this, additional research using the data from Canada resulted in an updated CP model of care, RESPIGHT[14] –

- **R**esponse to emergencies
- **E**ngaging with communities
- **S**ituated practice
- **P**rimary health care
- **I**ntegration with health, aged care and social services
- **G**overnance and leadership

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[13] P. O'Meara, V. Tourle, C. Stirling, J. Walker, and D. Pedler, **Extending the Paramedic role in rural Australia: a story of flexibility and innovation. Rural & Remote Health**. 2012; 12(2): 1–13.
Web: http://www.rrh.org.au/publishedarticles/article_print_1978.pdf

[14] P. O'Meara, C. Stirling, M. Ruest, and A. Martin, **Community paramedicine model of care: an observational, ethnographic case study**, BMC Health Services Research, 2016, 16:39, 1-11.
Web: http://ircp.info/Portals/11/Downloads/Research/RESPIGHT%20Model.pdf?ver=2016-02-03-032225-113

- **H**igher education
- **T**reatment and transport options

All the logic models emphasize the features which are closely linked to engage with local communities.

3. MIH & CP in the USA

The first paramedic program in the United States was started in Miami, Florida in 1969[4]. Following this, the first paramedic program in California was begun in Los Angeles County in 1970. Since 1970s and 1980s, there have been significant efforts taken to expand role of EMS services by improving the skills of paramedics. To understand the current development, characteristics and status of MIH-CP in the United States, NAEMT conducted a comprehensive survey[15] in late 2014 of the nation's currently operating MIH & CP programs. Around the USA, presently there have been plenty of services offered. Various studies indicate that 30-50% of the ED transports are inappropriate[16] or not required, 10-40% of the EMS transports are low-acuity transports and can be cared without transport to ED[17]. In 2006, 24.1% of the ED visits were semi or non-urgent[17]. There have been cases where the patients transported to the ED by the EMS leave without even being seen.

Orange County, N.C., and the State of Idaho independently initiated alternative approaches to the low-acuity patient in 1996 and 1997, respectively. These programs were successful and are continued even today. The Orange County program enables paramedics with additional training to treat, refer and transport low-acuity patients to a primary care provider for follow-up. The Idaho program was the first of its kind to create new Medicaid coverage and payment for "respond and evaluate" and "treat and release." The state also required services to develop their own protocols and procedures for patient transport and non-transport services[17]. Colorado has the longest history of rural community paramedicine development. In 2012, Minnesota became the first state to pass legislation authorizing Medicaid reimbursement of EMS-based community paramedics and has the greatest number of developed CP programs which are primarily based in the metropolitan area around Minneapolis. Indiana, Georgia and Maine have also launched a number of pilot community paramedicine programs recently[18]. Clayton County in Georgia launched their CP program in 2015, is one of the few paramedicine programs in U.S. which is fire department based.

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[15] **Mobile Integrated Healthcare and Community Paramedicine (MIH-CP)**, A National Survey, NAEMT
Web: https://www.naemt.org/docs/default-source/MIH-CP/naemt-mih-cp-report.pdf?sfvrsn=2

[16] B. L. Bigham, S. M. Kennedy, I. Drennan, and L. J. Morrison, **Expanding Paramedic Scope of Practice in the Community: A Systematic Review of the Literature**, Prehospital Emergency Care, July/September, 2013 Volume 17, Number 3, p. 361-372.
Web: http://ems.sinaiem.org/wp-content/uploads/2013/10/Community_Paramedicine_Syst_Review_-_Bigham_-_PEC_-_2013.pdf

[17] K. Krumperman, **History of Community Paramedicine**. Journal of Emergency Medical Services, June 2010.
Web: http://www.jems.com/articles/2010/06/history-community-paramedicine.html

[18] **GA. fire department starts community paramedicine program**, May 2015.
Web: http://www.ems1.com/community-paramedicine/articles/2166116-Ga-fire-department-starts-community-paramedicine-program/

Canton, New Jersey; Abbeville, South Carolina; and Dallas, Texas; are other communities which are running successful programs.

Dallas Fire Rescue department was able to successfully reduce the number of 911 callers by paramedics regularly visiting the patients at their home to teach them care for themselves and advocating them to use the 911 system properly[19]. Milwaukee Fire department[20], Wisconsin launched a three month pilot MIH program in October 2015, with paramedics setting up home visits, assess health and help connect repeated EMS users with medical services. In the beginning of 2015, Emergency Medical Services Authority (EMSA) launched pilot CP programs across 12 sites[21] - Alameda, Butte, Los Angeles, Orange, Santa Barbara, San Bernardino, San Diego, Stanislaus, Solano and Ventura Counties in California. The objective of these programs are to offer services such as: follow up care for patients recently discharged from the hospital, transportation to urgent care or mental health clinics, hospice support, follow up treatment of tuberculosis, and assist individuals who frequently utilize EMS to establish care with a PCP. These programs are proposed to be evaluated by the end of 2017, when the pilot program are expected to be finished. Data indicates that all these programs have been so far successful at improving patient care after hospital discharges and preventing unnecessary ER visits. About 300 similar programs of varied capacities are launched recently across the USA[22].

In rural areas, community paramedics help fill gaps in the local delivery system due to shortages of primary care physicians and long travel times to the nearest hospital or clinic. The advancement in medical technology also offers the diagnosis to be possible in the field. Thus MIH & CP in rural areas are focused on efficiently allocating scarce health care resources and improving access to care. In urban areas, the focus shifts to keep low-acuity emergency care out of ED by ensuring health care needs are met in other ways. The majority of these programs are in developmental or pilot stages. The spread of MIH & CP programs across the USA reported from NAEMT national survey report[15] indicate that there is a wide spread activity of MIH & CP programs across the USA with majority of the states (thirty three) having an operational MIH & CP program. This was the scenario by the end of 2014. However, the a

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[19] **Dallas program reduces 911 frequent fliers**, April 2015.
Web: http://www.ems1.com/community-paramedicine/articles/2164079-Dallas-program-reduces-911-frequent-fliers

[20] **Milwaukee to launch program to reduce repeat 911 callers**, April 2015.
Web: http://www.ems1.com/community-paramedicine/articles/2164685-Milwaukee-to-launch-program-to-reduce-repeat-911-callers

[21] **Community paramedicine pilot approved in California**, December 2014
Web: http://www.ems1.com/community-paramedicine/articles/2043994-Community-paramedicine-pilot-approved-in-Calif/

[22] **Community paramedic program focuses on preventive care**, February 2016.
Web: http://www.ems1.com/patient-care/articles/59009048-Community-paramedic-program-focuses-on-preventive-care/

deeper look into the survey[15] shows operating range of MIH & CP programs in different communities – Urban 54%, Suburban 44%, Rural 36% and Super rural 13%. This indicates that there are more MIH & CP programs operating in Urban and suburban areas as compared to the rural ones, even though the history of MIH & CP indicates they were initiated many to serve the rural areas. Further the data collected by NAEMT indicate, very less number of these programs operate for two years or longer.

3.1. Other Models & Programs:

a. ***Community Health Aides (CHA)***[11] Implemented in 1968, to provide training and direction for workers who provide emergency and primary care services under the daily direction of hospital based physician.

b. ***Community Health workers (CHW)***[11] A recent evaluation of rural CHW programs identified six CHW models in rural areas, in which CHWs are members of the care delivery team, health educators, promotors, outreach and enrollment service agents, community organizers, and care coordinators.

c. ***Community Care Teams (CCT)***[11] This emerging model of care coordination is for high-needs patients, especially those with chronic conditions. This model has been found to be effective in North Carolina, New York, Vermont, and Maine. CCTs work closely with patient-centered medical home (PCMH) practices and are multi-disciplinary and community based. Teams typically consist of a variety of healthcare providers, including dieticians, nurse practitioners, care transition coordinators, and also social workers, and work primarily with the Medicaid and Medicare populations.

d. ***Primary Care Technicians (PCT)***[11] PCT have similar roles as that of paramedics and they receive clinical training, provide in-home visits, work under medical direction, manage patients with chronic conditions, and help to prevent hospital readmissions.

3.2. Learning from different rural models

This section will review briefly two different models, Community Health Aide program and Red river project. The Community Health Aide Program[23] (CHAP) was developed in the 1960s and have been successful for now over 50 years. This was implemented in response to the health concerns in rural Alaska. The ultimate goal of the program was to connect underutilized resources to underserved populations. CHAP program, was started to serve against the tuberculosis epidemic, high infant mortality and high rates of injury, and now has

[23] **Alaska Community Health Aide Program**, Web: http://www.akchap.org/html/about-chap.html

expanded to a huge network of 550 Community Health Aides and Practitioners, covering more than 170 rural villages in Alaska. This is a great example where the government was able to successfully collaborate with Native Tribal Health Organizations (NTHO). CHAP program trains and employs local, indigenous peoples as primary care non-physician providers in extremely remote communities. Training the local residents is also advantageous to provide cultural sensitive services[24]. Model also was proved to be cost effective, and efficient.

A model may not sustain due to many reasons as we saw there are multiple components which affect the development and implementation of a model. Red-River project[25] in Taos County, New Mexico was operated from 1994 to 1999. During the implementation of this model, paramedics were given additional training to become Community Health Specialist (CHS) in order to serve the community. An elaborate description of this program for New Mexico medics can be learnt from the publication of Shoup[25] (1995). The evaluation performed in 1999 revealed that this project reduced the emergency call volume from 78% to 11%[44]. However, the project did not sustain later due to the lack of external quality control leading to poor standards in supervised practice. It is reported that there was no continued clinical reassessment, education, training, or clinical quality review[44]. An underdeveloped relationship with residents resulted in lack of support from residents in the community, which ultimately made the project short lived.

What we observed in the above two models is that the one which developed a healthy partnership with local residents and the other which did not. It may be concluded that the models which are developed for rural areas, would need a local resident support for sustainment.

3.3. Funding[26]

Potential Funding for Community Paramedicine Projects in the United States are identified from International Roundtable on Community Paramedicine[26]. The funding for MIH & CP can be through Federal Grants, Cooperative Agreements, and Contracts. Some of the potential funding resources are listed below.

- Department of Health and Human Services

[24] **The Alaska Community Health Aide Program: An Integrative Literature Review and Visions for Future Research,** August 2003.
Web: https://www.uaa.alaska.edu/acrh-ahec/projects/archives/upload/2004chap-lit-rev.pdf
[25] S. Shoup, **Red River Project. Expanded scope program for New Mexico medics**, Journal of Emergency Medical Services, December 1995, 20(12), p. 43-47.
[26] **Potential Funding for Community Paramedicine Projects in the United States**, 2013.
Web: http://ircp.info/Portals/11/Downloads/Funding/Funding_Streams_in_US.pdf?ver=2013-10-24-113402-000

- Office of Rural Health Policy
  - Outreach grants for community driven topics (Example, Red River Project, Livingston County Illness and Injury Prevention Project, Western EMS Network)
  - Rural Hospital Flexibility Grant Program, grants to states, EMS as an allowable activity (Example, Kansas EMS Community Planning Projects)
- EMS for Children
- Centers for Medicare and Medicaid Services
- Centers for Disease Control and Prevention - Center for Injury Prevention and Control
- National Highway Traffic Safety Administration
- Department of Homeland Security
- National Institutes of Health

While funding of CP programs is primarily a local activity, and early adopters are finding ways to begin CP programs, national funding is needed for larger development of CP as a field.

3.4. MIH & CP Outcome Evaluation

It is observed in the Fig. 1 evaluation of the outcomes from a MIH & CP model is crucial for demonstrating value in order to find stakeholders willing to fund a model for sustainability. The program evaluation should be focused on studying its impact on patient access, safety, health outcomes, satisfaction, and overall healthcare costs. Data collection and performance assessment need to address the advantages of CP providers' community knowledge and access to patients in their homes[12].

As it is seen in every successful models, the agenda should be to start small (pilot programs) and then to build upon the success from the pilot programs. Hence it is important to ensure that if program is ready for evaluation. If the evaluation is done premature, it can lead to false results which would be discouraging to further development of the project. Assessment should include carefully selected quantitative and qualitative measures of structure, process, and outcomes. It should also include workforce variables such as levels and types of education and experience, impacts on MIH & CP providers, and more importantly impacts on patient satisfaction[12]. Reports and literatures indicate that it is also important to review and investigate unintended consequences and the real costs and safety implications of these programs. Prior evaluations warn that sparsely populated rural areas will exhibit a high degree of variance in the outcomes, hence a comparison of a model developed for urban area with that of a rural area can result in variable outcomes.

The paper by Lambert et. al.[27], was the first to comprehensively measure and benchmark the comparative efficiency of EMS in US cities. They examined the efficiency of EMS delivery in different cities by including variables such as weather and climate, income, population growth, the age of a residential home, and geographic size of a city in land area into consideration. The research concluded that more densely settled, geographically large, and high income cities show more efficient provision of EMS in the US.

In 2012, the U. S. Department of Health and Human Services, Health Resources and Services Administration (HRSA) published a report[28] on "Community Paramedicine – Evaluation Tool". The assessment tool was designed to allow existing programs to do self-assessments as well as to develop frameworks for new CP programs. It also aims at creating performance indicators and setting benchmarks for every CP programs. The whole evaluation tool is built around three core functions of public health – assessment, policy development and assurance. For each of these functions, different benchmarks were defined. These benchmarks are related to performance indicators which are scored using different criteria.

MIH-CP measures development project team[29], consisting of representatives from different stakeholders developed a set of measures for the optimum sustainability and utilization of the MIH & CP programs in 2016[29]. As it is defined, the MIH-CP measures project offers a "universe" of measures from which an agency or a state or other MIH-CP pilot project sponsors can choose to describe the outcomes of services that it provides. This consisted of core measures, Center for Medicare and Medicaid Improvement (CMMI) measures, Mandatory measures and the ones identified from the numerous operating MIH & CP programs. The program design or structure measured include executive sponsorship, strategic plan, healthcare delivery system gap analysis, community resource capacity assessment, program integrity, organizational readiness assessment (medical oversight and health information technology), integration with local or regional healthcare system, public and stakeholder engagement, specialized training and education and compliance plan. Further interpretation of outcome measures, scoring system and explanation on how the scoring are used can be referred from the above cited report. For brevity of this project report they are not reproduced here.

A detailed cost analysis model on the emergency medical care is presented in the white paper[30] prepared by National Highway Traffic Safety Administration (NHTSA), Office of

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[27] T. Lambert, H. Min and A. K. Srinivasan, **Benchmarking and measuring the comparative efficiency of emergency medical services in major US cities**, Benchmarking: An International Journal, Vol. 16 No. 4, 2009 p. 543-561.
Web: http://www.emeraldinsight.com/doi/abs/10.1108/14635770910972450

[28] **Community Paramedicine – Evaluation Tool**, March 2012.
Web: http://www.hrsa.gov/ruralhealth/pdf/paramedicevaltool.pdf

[29] **MIH-CP outcome measures project.** Web: http://www.medstar911.org/mih-cp-outcome-measures-project

[30] **Innovation Opportunities in EMS: A draft white paper**, NHTSA and HHS, 2013.

Assistant Secretary for Preparedness and Response and Health Resources and Services Administration, (HHS). Although the model is based on certain assumptions, it proves the reduction of total health care cost by expanding the role of EMS.

Web: http://www.ems.gov/pdf/2013/EMS_Innovation_White_Paper-draft.pdf

4. Case Studies on Implementation of MIH & CP

This section will review different fire based and non-fire based case studies on different successful MIH & CP programs.

4.1. Fire Department Based Case Studies

Fire Departments have been responding to the medical emergencies ever since its existence. It is well known that there are very few organizations like fire departments that can cover an entire city or community. Even though, the mobile integrated healthcare and community paramedicine service delivery models have proved to provide improved care and as an alternate source of revenue for EMS providers, they are yet to be widely incorporated by the entire fire service community. It is understood that the majority of EMS services rely on fire departments as it tremendously helps in easily reaching to the communities. A few of fire department based CP programs launched recently and functioning successfully are mentioned earlier in Section 3. Fire department based EMS, is the one in which fire departments, in cooperation with local hospitals and physicians, train and deploy firefighters to respond to pre and post hospital needs and emergencies[3]. One great example for this is a 100 day pilot program launched by the Mesa Fire department, Arizona in collaboration with hospitals and physicians to manage the flu epidemic in 2007[3]. During this period, this program was able to successfully serve the medical needs of patients outside the hospital. The following sections briefly review some fire based community service providers with details about their programs.

4.1.1. Colorado Springs Fire Department

Colorado Springs Fire Department answers around sixty thousand 911 calls annually[15]. In 2012, they collaborated with a couple of hospitals to research about these large volume of 911 calls and to formulate a plan to redirect and handle some of these calls without using ED. They also realized that around 77% of the patients have mental health issues along with the other medical conditions. CARES[15] (Community Assistance Referral and Education Services) is the program which they developed and implemented as a result of this research. This was launched as a program in which EMTs and paramedics would continue the home visits, providing assistance with education and navigating patients to mental health or other community resources. By 2014, the CARES program outcome showed a 50% decrease in the 911 usage among two-thirds of patients. The fire department expanded the program to include two additional units – a Mobile Urgent Care unit and a Community Response Team.

- ***Mobile Urgent Care unit*** included a paramedic or EMT paired with a nurse practitioner who responded to low-acuity calls, and
- ***Community Response Team***, included a paramedic, behavioral health clinician and law enforcement officer who respond to 911 calls that are psychiatric in nature.

The success of the Colorado Springs Fire department highlight the fact for conducting a thorough community needs assessment for any successful MIH & CP program.

4.1.2. Golder Ranch Fire District's Community Integrated Healthcare Program[31]:

Golder Ranch Fire District (GRFD) started developing Community Integrated Healthcare Program (CIHP) in 2013, a mobile integrated healthcare service delivery model to deliver improved care. Within a year, the CIHP was developed through the involvement of personnel from every division of GRFD, North Tucson Firefighters IAFF Local-3832, and community stakeholders as well as neighboring jurisdictions including Northwest and Avra Valley Fire Districts. The goal of CIHP was to develop a regional program for:

- Promoting a healthier community,
- Reducing hospital re-admissions and
- Rightsizing the care of residents while ensuring participant access to healthcare resources are streamlined through a single point of contact.

CIHP became operational by mid of 2014 with experienced paramedics who have undergone an additional training locally in the areas of nutrition, disease-specific processes, smoking cessation, lab value interpretation and additional pharmacology. Eligible patients, who are discharged following inpatient admissions are provided with the program details. As the patients opt in for the program, an electronic patient care report (ePCR) is created with medical history and discharge summary. An integration of scheduled home visits, phone follow-ups, are done frequently. The care provided during home visits are guided by a series of administrative orders which are designed to support increasing the participant's knowledge and ability to self-manage their particular disease process. A 24 hour support is also provided along with the traditional 911 system. Thus the role of the GRFD CIP is to work in conjunction with hospitals and primary care and specialty physicians to improve the overall health of the population served.

[31] J. Hurguy, **Fire-Based Community Paramedicine: Golder Ranch Fire District's Community Integrated Healthcare Program,** Journal of Emergency Medical Services, Vol. 40, Issue 9, September 2015.
Web. http://www.jems.com/articles/print/volume-40/issue-9/features/fire-based-community-paramedicine-golder-ranch-fire-district-s-community-integrated-healthcare-program.html

4.1.3. San Diego Community Paramedicine:

San Diego is a large city with a significant homeless population and a busy EMS system. The patients who frequently use EMS services are identified through a Resource Access Program (RAP). This program, which began in 2008, works closely with San Diego Fire-Rescue department and Rural/Metro Ambulance (SDEMS). SDEMS implemented a one-touch referral button on providers' iPad to refer the patients who are identified as vulnerable in 2010. Further, SDEMS collaborated with a community partner 211 San Diego in order to handle large volume of referrals, resulting in developing an improved electronic referral system. Another use of technology is the usage of a software platform called Street Sense[49], which uses algorithms to sift through EMS patient care reports and identify frequent callers. While finding frequent users, Street Sense use algorithms to look at all the patient care reports for a particular patient and do a computer aided dispatch in real-time. A unique element of San Diego's approach is its integration of technology into the RAP program. The challenges faced by them while developing this referral system include – privacy and consent from patients, impact on workforce, collaboration procedures, and case management[32]. Beyond all these challenges, the integration with technology has resulted in a significant drop in transports among the most frequent EMS users in San Diego.

4.1.4. Dallas Fire-Rescue Dept.

An article published in December 2014[33] indicates that the pre-hospital delivery care in the city of Dallas has increased by around 18% in the last five years. This resulted in Dallas Fire Rescue Department (DFRD) to come up with a five year strategic plan to increase the efficiency of the existing EMS delivery system. Mobile Community Healthcare Program[34] (MCHP) by Dallas Fire Rescue Department was officially first started in March 2014 after more than 18 months of planning. This was the phase 1 of this program, which was a proactive service delivery model. This identified high utilizers and focus was to reduce their dependence on the 911 system. This involved an intensive case management process in association with the network of community organizations. DFRD identified the frequent callers and mobile community paramedics make contact with these patients who enrolled in the program, in order to serve to their needs. After assessing these requirements, the main

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[32] A. M. Jensen, **How San Diego EMS Integrated System-Wide Conditional Social Referrals in ePCRs**, Vol. 41, Issue 2, January 2016.
Web: http://www.jems.com/articles/print/volume-41/issue-2/features/how-san-diego-ems-integrated-system-wide-conditional-social-referrals-in-epcrs.html

[33] N. Seals and R. Ngugi, **City of Dallas Creative Improvement on EMS and Revenue Development**, Government Finance Review, December 2014.

[34] N. Seals, Asst. Chief, EMS Bureau Dallas Fire-Rescue Department, **Mobile Community Healthcare Program**, Presentation slides.

goal from of the Mobile community paramedics was to simplify the complex medical care process. At the end of the program, it is aimed to make each patient less dependent on the 911 system. The evaluation of the phase 1 at a six month period into the program indicated that, majority of the patients enrolled in this program reduced their overall 911 system utilization. Reduction in these call volumes results in cost avoidance. Looking at the success of the Phase 1, it was believed that as the program become more advanced, it can generate revenue and will have an impact on the cost of program. This gave birth to the second phase of this program from DFRD.

The second phase of this program, contracted with area hospitals where services was provided to: high utilization patients, and managed care program patients in order to avoid readmission in the hospitals. This has got a great response from the hospital partners. In this phase MCHP was designed such that in-home services were offered on behalf of the hospitals to the patients who had restricted mobility and transport to the hospitals. MCHP also provided post-discharge services during this phase. Those enrolled in the program will have a 24 hour access to the mobile community paramedics and hence do not have to use the 911 calls for any assistance. An early data form the phase 2 results indicate a great reduction in the 911 calls and ED visits. This program from DFRD is a classic example where a potential for revenue generation in the form of financial incentives to the municipalities and to hospital partners. This is really encouraging as we saw most of these MIH & CP programs struggle to look for long term funding. Further details of this can be obtained from the references cited.

4.1.5. McKinney Fire Dept. Community Healthcare Program

Being one of the fast growing cities in the United States, McKinney was facing large volume of 911 users. In McKinney, 911 frequent user is defined as someone who uses EMS more than four times in a six-month period and a large section of these users were old and were suffering from chronic diseases[49].

Having learnt from the implementation of other programs in Texas, an advanced practice paramedic program was planned by McKinney Fire dept. (MFD) and implemented this new six month community healthcare (CHP) pilot program in June 2013. MFD defines this new approach to EMS as "The right care at the right time"[35]. The Advanced Practice Paramedics (APP) from the MFD take the role of healthcare advocates and provide patients with a network of resources for appropriate care. The ultimate aim of APP is to reduce the need for patients to use the EMS and hospital emergency room services. This CHP was developed with broadening the role of EMS personnel and not by broadening the role of emergency medical

[35] **Community Healthcare Program, A new approach to Emergency Medical Services**.
Web: http://www.mckinneytexas.org/index.aspx?NID=1178

services provided by MFD. One of the many characteristics of this program was Priority Dispatching; where the severity of the injury or illness reported by the user is used for response dispatching. Other roles of APP include visiting patients at home and provide after discharge services to patients through a consultation with the healthcare provider[35]. The patient-APP contact/week has been done at MFD based on different categorization of cases. A patient would be categorized in any of four categories before they graduate from the program. This is based on the number of 911 use and documented hospital stays in 30 days, 60 days.

The importance of community partnerships was again evident in this program as McKinney Fire Department partnered with healthcare providers, social service agencies and other key providers to create a service that better meet the needs of community[35]. The evaluation of the program was measured after 6 month enrollment period for a user to verify the effect of CHP on the user's 911 call after enrolling in the program. A logistic regression analysis was performed and the data were analyzed using STATA 12.0 statistical software[36]. Outcomes indicate that apart from more than 50% reduction in the non-emergency 911 calls and hospital readmissions, there was almost a 50% reduction in the paramedic staffed Fire truck response. A detailed results from the evaluation outcome of the pilot program can be observed in the reference cited[36]. The MFD plans to continue and expand CHP with services like health screenings, wellness education, immunizations, chronic disease management and home health and safety programs[37].

4.1.6. Mesa Fire & Medical Department

Mesa Fire and Medical Department, Arizona were the one of the earliest adopters of this out of hospital healthcare idea among the Fire Department service models for MIH & CP. As mentioned earlier, the 100 day pilot program launched by the Mesa Fire department in collaboration with hospitals and physicians to manage the flu epidemic in 2007 successfully served the medical needs of patients outside the hospital.

Mesa Fire and Medical Dept. came up with an idea to handle the Basic Life Support (BLS) calls with trained paramedics and EMTs on vehicles called as Transitional Response Vehicles

[36] **A pilot study from McKinney Community Health Paramedicine program and BEST EMS**, American College of Emergency Physicians.
Web: https://www.acep.org/content.aspx?id=96674
[37] S. Durham, **McKinney Fire Department's Innovative Healthcare Program,** McKinney Online.
Web: http://www.mckinneyonline.com/February-2014/McKinney-Fire-Departments-Innovative-Healthcare-Program/

(TRV)[38]. TRVs are different in the way that they are two-person low emergency response units with one paramedic captain and one Firefighter EMT[39]. There is a huge amount of calls, which are mostly found to be from assisted living facilities. The main objective is to utilize the resources in such a manner that these calls are assisted without dispatching the full engine. As the calls are attended, based on whether it is a BLS or ALS (Advanced Life Support), a TRV or a full engine is dispatched – Priority Dispatch Triage[40]. By using the TRV to attend the low acuity patient calls, the ALS units will still be available for emergencies. This is also planned based on the call volumes received from different areas. Currently Mesa Fire and Medical dept. runs four TRVs and two Community care units. TRVs are able to handle around 1000 incidents per year. TRV program serves for both treat and release as well as post-surgical follow-ups at home. At the time of the awarding of the CMS grant the TRV operations were replaced with the Advanced Practice Providers and Licensed Crisis Counselors on the Community Medicine units. These units are running about 5,000 calls for service annually. The TRV's post grant award are called Community Medicine units.

In 2013, Mesa Fire and Medical dept. expanded to include behavioral health assistance. As it was observed that the 7-10% calls were involving behavioral health issues and majority (around 80%) of them were not emergency calls, the community medicine units can produce great results without transporting the patients to the hospitals. For this program for behavioral health related calls, two crisis counselors also accompany the CM staff. The behavioral health Community Medicine units are staffed by one master's level licensed clinician and one MFMD medic. The community care response units consists of a captain paramedic and nurse practitioner/behavioral health specialist. They focus on treating and referring the patients to PCP or appropriate healthcare providers. Currently a 75% (variable) ED diversion rate for patients treated under the community care model is experienced. These patients are either treated and referred back to their PCP or are transferred to an in-patient behavioral facility directly. They also provide improved service levels by 24 hour patient follow-ups. Mesa Fire and Medical Dept. are exploring both telemedicine and telehealth models that may be deployed effectively by these units. The Nurse Triage is an integral part of the entire system.

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[38] **Mesa Fire Department Implements Transitional Response Vehicles Program**, Journal of Emergency Medical Services, Vol. 37, Issue 4, April 2012. Web: http://www.jems.com/articles/print/volume-37/issue-4/patient-care/mesa-fire-department-implements-transiti.html

[39] H. Beck**, Changes in Fire Department EMS Delivery, The MESA Experience**, Arizona Fire Chiefs Association 2013 Leadership Conference, 2013. Presentation Slides.
Web: http://www.mesaaz.gov/home/showdocument?id=114

[40] H. Beck and G. Smith, **Fire-Based EMS The Next Generation**, Mesa Fire and Medical Department,
Web: http://www.mesaaz.gov/home/showdocument?id=116

One of the major outcome of these programs, apart from the huge financial savings is the enormous decrease in the vehicle wear and tear and much improved and efficient transport process operation. A detailed cost analysis can be observed from the Presentation slides[40] available at http://www.mesaaz.gov/residents/fire-medical. Mesa Fire and Medical department TRV/Community Medical unit program is one great case study to understand the transport process improvement and effective optimal utilization of available resources. The Future plans include expanding these programs to a mid-level provider program through increased partnerships/collaborations with hospitals, specialty providers and insurance carriers[39], public school partnerships, on-sire medical direction and telemedicine and telehealth models. All these programs and partnerships can lead to delivering better care at reduced costs.

4.1.7. Other Fire Based Community Healthcare Providers – References

This section will provide additional references related to the Fire department based community healthcare programs. For brevity of this report, additional information on these programs are not reported here, appropriate references are provided.

- ***Plano Community Paramedicine Program, Texas*** – The program is in collaboration with local hospitals to assist and increase the overall well-being of recently discharged patients and to better assist the frequent 911 users.

Reference: Plano's Community Paramedic Program win for patients, city.
Web: http://starlocalmedia.com/planocourier/news/plano-s-community-paramedic-program-win-for-patients-city/article_948df6b8-7e73-11e5-9441-1f423e0351f4.html

- ***Salt Lake City Fire Rescue, Utah*** – This is focused on addressing the large number of non-emergency 911 calls through out of hospital based care.

Reference: S. T. Youngquist, The 911/EMS System and Community Health: Filling the Gaps, PowerPoint slides.
Web:
http://www.slcfire.com/external/content/document/3687/1658467/1/Community%20Paramedic%20911%20Dispatch%20Presentation%20update.pdf

- ***Santa Monica Fire Dept., California*** – Community EMS model to empower EMTs and paramedics to treat patients in the field.

Reference: Officials propose new emergency medical systems.
Web: http://smdp.com/officials-propose-new-emergency-medical-systems/122948

Electronic tool kits are available intended to provide fire service managers and other officials with current information on fire-service based emergency medical services.

- Fire Service-Based EMS electronic tool kit, Resources for leaders.
  Web: http://www.mesaaz.gov/home/showdocument?id=120
- Fire Service-Based EMS, New toolkit for use.
  Web: http://www.mesaaz.gov/home/showdocument?id=118

4.2. A Government Non-Fire based organization case study

4.2.1. What and how they do?[41]

This mobile health care paramedics program provides in home and telephone based support to patients who frequently call 911. It also serve the other patients from preventable admissions or readmissions[41]. These steps are followed by the paramedics:

- Conduct a detailed medical assessment
- Develop a customized care plan
- Periodically visit or telephone the patient and family for following the plan till they are on their own

The ultimate goal of this Mobile Healthcare Program is to meet the Institute for Healthcare Improvement's Triple Aim: Improve patient outcomes, including their experience of care; Improve the health of the population; and Reduce Costs[43].

4.2.2. MIH programs[42]

There are a significant number of programs which are developed and implemented considering all aspects of MIH & CP. A short description of them are provided below.

- ***911 Nurse Triage Program***: In this program, low acuity 911 callers are referred to a specially trained RN through the call center who helps the patient find appropriate resources for their medical issue. The major outcome from this program is the savings in healthcare expenditures for ambulance transport and emergency department expenditures.
- ***"EMS Loyalty" Program:*** Patients who use 911, 15 or more times in 90 days, or are referred to this program due to high ED utilization. MIH paramedics conduct regular home visits, educate and inform the patients about the available resources. This program have reduced ambulance transports to the ED.

[41] **Measuring the effectiveness of Mobile Integrated Healthcare Programs**, Presentation Slides
Web: http://www.medstar911.org/Websites/medstar911/images/MIH_Measures_Overview.pdf
[42] **Mobile Healthcare Programs – Overview**. Web: http://www.medstar911.org/mobile-healthcare-programs

- ***Readmission Avoidance:*** This is mainly for patients who are at risk for a 30-day readmission. In this program paramedics, educate the patient and family on appropriate care management and loops the patient to their Primary Care Physician (PCP) though a series of home visits.
- ***Hospice Revocation Avoidance:*** Patients/families at risk for revoking hospice status by calling 911 for an urgent trip to the ED are identified by the Hospice agency. Coordinating with a hospice agency, efforts are taken to reduce the possibility of the patient/family revoking hospice status.
- ***Observation Admission Avoidance:*** Working with our local ACO, patients who may be admitted to ED observation status may instead be referred by the ED physician to the MIH program. The MHP provides an overnight visit to do an in-home assessment and coordinate the transition of care back to the patient's PCP the next day.
- ***Home Health Partnership:*** Through an innovative partnership with different home health care groups, collaborate to provide effective after-hours episodic care for patients.

4.2.3. Outcomes

A reduction in the number of:

- 911 calls
- Potentially preventable emergency department visits and hospital admissions
- Overnight observational admissions
- Hospice revocations
- EMS charges and costs
- Emergency department crowding

4.2.3.1. Highlights of Outcomes[43]

Patients who called 911 with low-acuity medical conditions were successfully referred through nurse triage program to dispositions other than an ambulance to the ED. Since 2009, 911 calls from program enrollees with two years of utilization data decreased by 67.9% for the year following their program. Patients enrolled in the high-utilizer program experienced a 58.1% reduction in ED visits. Inpatient admissions dropped by 45.3% among enrollees. Further these programs have resulted in tremendous amount of cost savings.

4.2.4. Other Government Non-Fire Based Case Study – Reference

- ***Wake County Advanced Practice Paramedic (APP) program, North Carolina*** – Implemented in January 2009, this program works on three main objectives – Reduce,

[43] **AHRQ Recognizes MedStar's Latest MIH Results.** May 2015.
Web: http://www.emsworld.com/news/12074772/ahrq-recognizes-medstars-latest-mih-results

Redirect and Respond. Reducing the occurrence of medical crisis, redirecting the people of mental health or substance abuse crisis and Responding to critical emergencies through additionally experienced paramedics.

Reference: Advanced Practice Paramedics.

Web:

http://www.wakegov.com/ems/about/staff/Pages/advancedpracticeparamedics.aspx

5. MIH & CP around the World

<u>Reference:</u> This section is prepared predominantly based on the report and its references by: H. Wang, "Community Paramedicine – Summary of Evidence", January 2011.

Practice of Mobile Integrated Healthcare and Community Paramedicine has been more established in many countries around the world. This section will go through some successful models and programs which are implemented in different communities around the world. As we understood from earlier sections, Community Paramedicine is meant to bridge the gap between primary health care and hospital emergency by expanding the role of paramedics[44]. There is an evident increasing demand for health care especially in the remote/rural areas along with a higher financial pressure in the health care system. CP provides a broader health care service for local communities. Hence it aides to develop an efficient health care model. Different initiatives around the world have resulted in remarkable outcomes. Communities, in Australia have emphasized more on implementing rural and remote paramedics, while other countries like UK and Canada have implemented the expanded paramedic practice within different environments including rural, remote, regional, and metropolitan settings. Even though a successful MIH & CP program can be developed only by understanding a particular community's needs and requirements, it is important to get educated from other successfully implemented models. Because these issues are not limited to any country, a review will help to understand this topic globally.

5.1. Australia

From Wang[44] (2011), Australia have successfully implemented three community paramedic models in their communities:

- Primary health care model,
- Substitution model, and
- Community coordination model.

5.1.1. The primary health care model

This model was developed in the area of Queensland and New South Wales as a result of increased ambulance demand, ageing population, rising prevalence of chronic disease, and decreased accessibility for unpredicted care and after hours care[44]. The model implements extended role of paramedics to address these issues.

[44] H. Wang, **Community Paramedicine – Summary of Evidence**, January 2011.

5.1.2. The substitution model

Substitution model was implemented to engage paramedics as substitutes and leave coverage for physicians and nursing staffs. This was implemented in some South Australian (SA) country hospitals and in Alice Springs Emergency Department (ED) where physician and nursing shortage was experienced. Proper steps were taken by health departments and hospitals to ensure only permitted paramedics were allowed to work in these conditions. This allowed the communities to be served in the absence of physicians and nursing staffs.

5.1.3. Community coordination model

This model focused on recruiting, retaining and supporting existing volunteers while supporting the existing health services as needed. Effective and efficient care to rural and remote communities was delivered through this model in the regions of South Eastern Victoria, Tasmania, and Western Australia[45].

All the above models in Australia emphasize the fact of stakeholder focused program development as the reason for successful implementation. It is also realized that the role of paramedics changes when they are in rural and urban communities. The rural paramedics have to take larger responsibilities of the whole community and have to be good in developing inter-professional relationships. Whereas, most urban CP models in Australia followed a case by case dispatch approach[46].

5.2. United Kingdom

As noted by Wang[44] (2011), Emergency Care Practitioner (ECP) program developed in 2003, is the most impactful program out of the various CP models implemented in UK.

5.2.1. What and how they do?

The aim of this program as described by Wang's report[44], is to provide assessment and treatment of minor illness and injury within the community without necessarily transporting the patient to the hospital. An ECP may be defined[47] as *"a healthcare professional who works to a medical model, with the attitude, skills and knowledge base to deliver holistic care and*

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[45] N. Blacker, L. Pearson, and T. Walker, **Redesigning paramedic models of care to meet rural and remote community needs.** The 10th National Rural Health Conference, Cairns, Australia, May 17-20, 2009.
Web: http://ruralhealth.org.au/10thNRHC/10thnrhc.ruralhealth.org.au/papers/docs/Blacker_Natalie_D4.pdf

[46] P. Mulholland, C. Stirling, and J. Walker. **Roles of the rural paramedic-much more than clinical expertise**. The 10th National Rural Health Conference, Cairns, Australia, May 17-20, 2009.
Web: http://www.hse.ie/eng/services/list/3/nas/research/Roles_of_the_Rural_Paramedic.pdf

[47] M. Bilby, **Emergency Care Practitioners**, Presentation.
Web: http://ircp.info/Portals/11/Downloads/Expanded%20Role/Bilby%20-%20ECPs.pdf?ver=2013-10-24-113300-000

treatment within the pre-hospital, primary & acute care settings with a broadly defined level of autonomy".

On a larger role the ECPs provide varied range of services[48]:

- Conduct and interpret diagnostic tests,
- Routine assessments of patients with chronic conditions in their home,
- Refer patients to social care services and directly admitting them to specialist units,
- Prescribe medications.

Further, the necessary clinical support was provided by the ambulance services or host providers. ECPs are primarily employed by Ambulance Service trusts and work in a variety of urban and rural settings, including General Practitioner (GP) surgeries, minor injuries units, and hospital Accidence & Emergency (AE) department.

5.2.2. Major Outcomes

The evaluation of ECP program indicates positive and encouraging results.

- Significantly fewer hospital or AE department admissions
- Transports to hospital AE were reduced
- Hospital and AE attendance had been reduced by 50% in most pilot sites
- 77% patients indicated that they would prefer to see ECPs than other health care professionals
- Total cost for treating patient by ECP was about 40% less than that patient treated by paramedics and subsequently transferred to hospital.

An important lesson learnt from the ECP program was to constantly monitor the success of roll out and make appropriate changes. It is also realized that for a model to be deployed effectively, it takes time and modifications after implementation. Hence the evaluation of outcomes in real-time must be significantly emphasized.

5.3. Canada

5.3.1. Toronto EMS CP program

This program began in 1999 with a mission to help patients in the community to solve some of their medical and care problems before they become real emergencies. Services offered by this program include hot weather response plan, window & balcony safety program, vaccinations (Influenza, Hepatitis A, Meningitis C, and Streptococcal Pneumonia), infection

[48] S. Raven, V. Tippett, J. G. Ferguson, and S. Smith, **An exploration of expanded paramedic healthcare roles for Queensland (1st ed.)**. Queensland, Australia, 2006.

prevention and control, and Community Referrals by EMS (CREMS). The major outcome from this program is the reduction of repeated 911 calls by up to 80%.

5.3.2. Nova Scotia

This is an innovative health care delivery model where community paramedics collaborated with registered nurse practitioners, which was implemented in the rural communities of Long and Brier Islands[44]. This model started with the services such as flu shots, holding clinics, checking blood pressures etc. and later allowed the expansion of community paramedic services to provide wound care, congestive heart failure assessments, fall prevention and home assessments, medication reconciliation, and community health promotion, and was shown to be effective in reducing emergency room visits[11]. These expanded community paramedic services have been incorporated into Nova Scotia's Emergency Health Service (EHS) competencies. Other future models were developed from the success of this model.

5.3.3. Winnipeg[49]

With a population of over 700,000, was dealing with frequent emergency calls of low –acuity problems and mostly identified from the same people. Winnipeg is situated in the mostly rural central Canadian province of Manitoba. Their first project, named as the Main Street Project, provided emergency shelter, detox, transitional housing and other services. The multiple transport of patients to ED for low acuity problems not only was inefficient, but also it wasn't producing much revenue insurance coverage does not pay for emergent ambulance transports. In 2010, a joint venture between the Winnipeg Regional Health Authority and the Fire Paramedic Service, the program expanded to have more paramedics and for 24 hours a day. The role of paramedics was to provide medical clearance, primary care referral, and emergency response at the facility; they also conducted health promotion and prevention programs. A significant drop in the need for ambulance responses was observed.

From the success of the first project, another project EPIC — Emergency Paramedics in the Community was launched in 2013. Out of the many objectives of this program, the major one was to curb the use of emergency ambulance services by those who call the most often. This was done by identifying individuals who had called more than 10 times in a six-month period. The paramedics received additional training on the social determinants of health, illness prevention, health promotion, advanced wound care, and other topics. The main goal of EPIC was not to become these patients' medical home, but to find them one, and to link them to other resources that could help address social, psychological, and medical issues. Three months into the pilot program, ambulance transports for the group had decreased by about 60 percent. The success of these programs is also a great example of collaboration with

[49] **How 4 cities are making community paramedicine work for them,** July 2014.
Web: http://www.ems1.com/community-paramedicine/articles/1949030-How-4-cities-are-making-community-paramedicine-work-for-them/

community's fire paramedic service and use of a real-time surveillance and monitoring software system called FirstWatch, for providing timely service.

There are other reports on the successful models and pilot programs operating in Canada. Reviewing all of them is beyond the scope of the objective of this report.

5.4. South Asia[50]

Mobile Integrated Healthcare and Community Paramedicine are still new in South Asian nations and they are trying to learn from the Western healthcare programs. The article by Hossain et. al.,[50] discusses some case studies from South Asia, where the need for improved healthcare with community development is highlighted. The biggest problem faced by these countries were the socio-economic division and by early 1970's, with the rise in the cost of medical care, the rural and the urban poor who comprise the 85% of the population were almost neglected. This marked the beginning of some community based healthcare approaches mostly under the leadership of motivated doctors and non-medical individuals. The initial phase of these projects focused on[50]:

- ***Integrated and Comprehensive models with Training*** – involving training to local volunteers and creating awareness of self-help and local resources.
- ***Health education campaigns*** – Focusing on single health issues like immunization, AIDS etc.
- ***Development of financial resources*** – raising funds to support existing activities

5.4.1. Examples: Bangladesh, India and Pakistan

- ***Chakaria Community Health Project, Bangladesh*** – Launched in 1994, the project's objective was to establish a strategy to ensure community participation in health matters and to improve health issues. The project promoted health issues by encouraging preventive measures and usage of existing health facilities. The evaluation at the end of four years showed that, 33% of families had subscribed to a health card, which gave them access to subsidized basic health care, and immunization rates had improved by 52%.
- ***Comprehensive Rural Health Project, Jamkhed, India*** – This was one of the earliest initiatives in India, launched in 1977. Main objective was to provide health services and facilities to the poorest rural villages. Activities revolved around health and family planning and development procedures by offering curative services, mobilization of the community by the community health volunteers. The project succeeded in greatly

[50] S. M. Hossain, A. Bhuiya, A. R. Khan and I. Uhaa, **Community development and its impact on health: South Asian experience**, British Medical Journal, 2004 April 3; 328(7443), p. 830-33.

reducing chronic diseases such as leprosy, tuberculosis, malaria and a marked decline in infant mortality is also was witnessed.

- ***HANDS-AKF project, Pakistan*** – This was launched during 1999-2001, to train local healthcare workers and community midwives and attendants, provide preventive and curative health services and to provide proper reproductive healthcare to reduce the maternal and infant mortality.

There are evidences of other community development models in other parts of South Asia[50] including Bhutan, Sri Lanka, and Nepal etc. But most of them are small scale and term projects with a focus to attend the immediate attention. Further it is evident that, the idea of MIH and CP are still evolving in this part of the world. It is also realized that there is a cultural impact on the development of these community based programs.

6. Summary

This project is focused on the emerging models of healthcare, namely Mobile Integrated Healthcare and Community Paramedicine. Information about this value based healthcare practice with a focus on Fire department based programs are collected and reported based on a thorough literature review. It is realized that plenty of services are offered by MIH & CP programs, including both pre-hospital and post hospital healthcare. While there is an abundance of national and international reports encouraging the use of these programs, there is a scarcity in the peer-reviewed literature regarding evaluations and outcomes, especially in the USA. But reports indicate, increased presence of these programs around the USA. MIH & CP programs can be relevant to both rural and urban areas, but these communities have different capabilities and needs. Hence developing, implementing and evaluating these programs for rural and urban areas should be done differently. As the fire departments closely work for and in every community, there is a tremendous opportunity for fire department based MIH & CP programs.

The case studies reviewed in this report indicates that a successful program should capitalize on linkages, collaboration and integration with other health care resources in the community. The ultimate goal of most of these programs have been to achieve three things: improve patient experience, improve patient outcomes and reduce costs[51]. The key to achieving these goals being able to work collaboratively with a wide variety of public health and health care providers, for which data and information sharing among the contributors remains a challenge. There is also an opportunity for innovation. With the ever improving technologies, there can be more out of hospital emergency services be provided. One example, which can be explored with technology is the provision of telemedicine consultation and real time dispatch of results from tests. Another integral part of any model is its evaluation and review of outcomes. It is realized that successful models were launched as pilot programs and then expanded into larger ones. It is important to ensure that programs are ready for evaluation at the right time. Many evaluation or assessment criteria must be repeated at various intervals. Beyond all these, there should be a clear and formalized description and clarification needed on the expanded role of paramedics/EMTs. Additional training programs for the paramedics are crucial for this to be achieved.

[51] **How to build a community paramedicine program**, February 2014.
Web: http://www.ems1.com/medical-clinical/articles/1666012-How-to-build-a-community-paramedicine-program