Fire and Emergency Service Personnel Knowledge and Skills Proficiency

Abstract

A research project was conducted to evaluate the current approaches utilized in the fire service for proficiency training and continuing education (CE). Approaches utilized by parallel professions, e.g. emergency medical providers, nurses, law enforcement officers, and teachers, were also assessed. Based upon these findings, a CE model was developed. The study found that every State and all the Canadian Provinces have at least one Pro Board or IFSAC Accredited Agency, however only 20 States (and no Canadian Provinces) have a continuing education program for recurrent training, recertification, or license renewal. These continuing education programs, along with the NFPA standards, most commonly required recurrent training on an annual basis. Considering all the professions and average hourly requirements, a 24 hour per year certification "renewal" model was recommended for firefighters. The continuing education program would include a minimum of one live fire training per year, as well as methods to evaluate all associated job performance requirements. A variety of methods is recommended to support completion of continuing education requirements including face-to-face and online training.

Introduction

The issue of continuing education (CE) and implementation of appropriate methods for maintenance of personnel knowledge and skills proficiency has been a long-standing challenge within the fire and emergency services (FEMS). Advances in fire behavior research have led to changes in firefighting tactics and technologies. These advancements in fire science reveal the critical importance of CE in the fire service. CE is not limited to maintenance of initial skills and core competencies. Rather, CE is also necessary to ensure that firefighters are current with changes

in suppression and ventilation techniques, building construction, fire dynamics, personal protective equipment, and firefighter health and safety, amongst other things.

Emergency service providers generally recognize the need to ensure that personnel are appropriately trained and fluent in the state-of-the-art in their discipline(s), however, ensuring this need is fulfilled is often met with staffing, time, and financial restrictions. Because of these obstacles, the impact of which vary across different departmental models (e.g. career, volunteer, county, city, etc.) only federally mandated requirements, such as annual hazardous materials, respiratory protection, and infectious disease training, have been uniformly implemented by fire departments. Thus, there is a lack of consistency in frequency, hourly requirements, and training content in the handful of CE programs that go beyond these federally mandated requirements. As such, there is a need to determine if CE should be more systematically implemented across the fire service, as is currently done when assessing initial knowledge and skills proficiency.

Research Objectives and Methodology

The research objective was to evaluate the current approaches utilized for proficiency training and CE across the U.S. and Canada in the fire service as well as parallel professions. A secondary objective of this research was to develop a CE model based upon these current approaches. Current practice was evaluated by reviewing the NFPA Pro-Qual and Training standards to identify those standards with CE requirements and the required cycle for CE. Additionally, extensive online research was performed to determine which States and Provinces currently have CE requirements in place and to identify the details of those requirements. A second literature review was conducted to identify CE methods utilized in parallel professions, e.g. emergency medical, nursing, law enforcement, and teaching. These methods were assessed to determine if they could be applied in programs for fire service knowledge and skills proficiency.

Resources such as the National Registry of Emergency Medical Technicians, AAACEUs, Lipcott Nursing Center, Target Solutions, Police One Academy, and the National Board for Professional Teaching Standards, were utilized. Additionally, a survey was conducted to determine the most prevalent frequency, hourly requirements, and methods for CE utilized by the fire service and parallel professions. Using this data, a recommended CE model was developed based upon the most prevalent frequency, duration, and implementation methods currently utilized within the fire service and parallel professions, in coordination with requirements present in the NFPA Pro-Qual and Training Standards.

NFPA Standards

A total of 22 NFPA Pro-Qual standards (NFPA 1000-1005, 1021, 1026, 1031, 1033, 1035, 1037, 1041, 1051, 1061, 1071, 1072, 1078, 1081, 1082, 1091, and 1521) and seven other NFPA standards (NFPA 405, 472, 473, 1404, 1407, 1451, and 1670) related to competencies, proficiencies, and training were reviewed to evaluate approaches to CE and skills maintenance. A comprehensive list of extracted sections from the reviewed standards is provided by McAllister et al (2019). The literature review showed that a recognized need for CE and skills maintenance is not a new concept. The need for CE has been expressed in various ways in the NFPA Pro-Qual and Training standards for at least a decade. For example, NFPA 1000 has required certifying entities to have a "Currency and Recertification" policy since 1994, and those with Fire Officer IV certifications have been required to "establish and evaluate a list of education and in-service training goals…so that all members can achieve and maintain required proficiencies" since 1997.

The current editions of the NFPA Pro-Qual standards require fire service members to "remain current" with the knowledge and skills related to their certification. Ten NFPA standards specify an annual CE frequency. NFPA 1071 was the only standard which included a required

number of CE hours. In addition to the requirements within the NFPA Pro-Qual and Training Standards, OSHA 29 CFR 1910.156(c)(2) requires that the employer "assure that training and education is conducted frequently enough to assure that each member of the fire brigade is able to perform the member's assigned duties and functions satisfactorily and in a safe manner so as not to endanger fire brigade members or other employees. All fire brigade members shall be provided with training **at least annually**. In addition, fire brigade members who are expected to perform interior structural fire fighting shall be provided with an education session or training **at least quarterly**." Additionally, OSHA 29 CFR 1910.120(q)(8)(i), 1910.134(k)(5), and 1910.1030(g)(2)(ii)(B) requires an **annual** demonstration of competency in hazardous materials response, respiratory protection, and blood borne pathogens.

CE Requirements by State

Each State in the U.S. and Province in Canadian was researched to establish those entities who currently have knowledge and skills proficiency requirements or recertification practices in place. No information was found to indicate that any Canadian Provinces have defined requirements for CE. This review did not include policies or practices within cities, towns, counties, or other local jurisdictions, rather it included policies and practices implemented at a State level. Additionally, the research findings presented in Table 1 are based upon those States which had published policies available on the web, as that was the primary method for data collection.

State	Position	ConEd Requirement
Alabama	Firefighter	30 hours per year
Alaska	Fire Investigator	40 hours every 3 years
	Fire Service Instructor	40 hours every 5 years

California	Fire Mechanics	36 hours every 5 years
Colorado	Driver Operator	3 year renewal (no defined hourly req.)
	Firefighter	3 year renewal (no defined hourly req.)
	Fire Officer	3 year renewal (no defined hourly req.)
	Fire Service Instructor	12 hours every 3 years
	HazMat	3 year renewal (no defined hourly req.)
Indiana	Fire Service Instructor	20 hours every 2 years
Iowa	Firefighter	24 hours per year[1]
Georgia	Firefighter	24 hours per year[2]
Kansas	Aircraft Firefighter	Annual renewal (no defined hourly req.)
Kentucky	Firefighter	20 hours per year (volunteer)
	Firefighter	100 hours per year (career)
Maryland	Fire Service Instructor	12 hours every 3 years
Michigan	Fire Inspector	60 hours every 3 years
Minnesota	Firefighter	72 hours every 3 years
Missouri	Fire Service Instructor	24 hours every 3 years
	Fire Inspector	30 hours every 3 years
	Fire Investigator	30 hours every 3 years
	Technical Rescuer	8 hours per year
	HazMat	8 hours per year
New York	Firefighter[3]	Annual refresher training (no defined hourly req)
Ohio	Firefighter	18 hours per year not to exceed 54 hours after 3 years of certification
	Fire Inspector	8 hours per year not to exceed 24 hours after 3 years of certification
	Fire Service Instructor	8 hours per year not to exceed 24 hours after 3 years of certification
	HazMat (Rec Officer)	2 hours per year not to exceed 6 hours after 3 years of certification

[1] Applies to all fire service members regardless of position.
[2] Training can be used towards maintenance of other certifications.
[3] Applies to all fire service members regardless of position.

Oregon	Aircraft Firefighter	60 hours per year[4]
	Driver Operator	60 hours per year
	Firefighter	60 hours per year
	Fire Inspector	12 hours per year
	Fire Investigator	12 hours per year
	Fire Officer I/II	60 hours per year
	Fire Officer III/IV	12 hours per year
	Fire Service Instructor	4 hours per year
	HazMat	60 hours per year
	Marine Firefighter	60 hours per year
	Technical Rescuer	60 hours per year
	Wildland Firefighter	60 hours per year
Texas	Aircraft Firefighter	20 hours per year
	Firefighter (Structural)	20 hours per year
	Fire Inspector	20 hours per year
	Fire Investigator	20 hours per year
	Fire Service Instructor	20 hours per year
	Haz Mat Tech	8 hours per year in addition to other applicable CEs
	Head of Fire Dept	20 hours per year
	Marine Firefighter	20 hours per year
	Wildland Firefighter	4 hours per year inclusive of 18 hours per year
	Other Certifications	18 hours per year
Utah	Aircraft Firefighter	36 hours per year
	Driver Operator	36 hours per year
	Firefighter	36 hours per year
	Fire Investigator	36 hours per year
	FLS Educator	36 hours per year
	Fire Officer	36 hours per year
	Fire Service Instructor	36 hours per year
	Technical Rescuer	36 hours per year
	Wildland Firefighter	36 hours per year
Vermont	Firefighter	24 hours per year
	Fire Inspector	60 hours every 3 years
	Fire Officer	24 hours per year
Wisconsin	Emergency Service Instructor	240 hours every 5 years

[4] All Oregon certifications with hourly requirement can also be fulfilled through "service delivery" or "task performance" or "any combination of service delivery, task performance, and education and/or training."

Table 1: States with CE policies.

It was found that only the federally mandated OSHA requirements related to hazardous materials, respiratory protection, and blood borne pathogens have been uniformly implemented by fire departments across the U.S. As shown in Table 1, only 20 States have recurrent training, recertification, or license renewal policies and only 18 of the 20 States specify hourly requirements.

Parallel profession- Emergency Medical Providers

The main resource for emergency medical provider CE requirements was the National Registry of Emergency Medical Technicians. Almost all States require NREMT and NR Paramedic (NRP) certification except for Illinois and Montana where certification is optional and New York and North Carolina where certification is through alternate entry (NREMT, 2019a, NREMT, 2019b). Alaska also allows alternate entry for EMT certification, but not for Paramedic certification (NREMT, 2019a, NREMT, 2019b). In assessing CE requirements for emergency medical providers, it was assumed that States who require initial certification through NR also allow for or require recertification through NR.

Table 2 provides a summary of requirements for NR recertification (NR, 2019c). All recertification occurs on a 2-year cycle and allows recertification by examination or continuing education. The overall hourly CE requirements for Emergency Medical Responder (EMR), EMT, Advanced EMT (AEMT), and Paramedic are 16 hours, 40 hours, 50 hours, and 60 hours, respectively.

Certification	Renewal Period	Method	CE Requirement	Distributive Education (Maximum)

EMR (NR)	Every 2 years	Exam or ConEd	16 hours National- 8 hours State- 4 hours Individual- 4 hours	National- 3 hours State- 3 hours Individual- 4 hours
EMT (NR)	Every 2 years	Exam or ConEd	40 hours National- 20 hours State- 10 hours Individual- 10 hours	National- 7 hours State- 7 hours Individual- 10 hours
AEMT (NR)	Every 2 years	Exam or ConEd	50 hours National- 25 hours State- 12.5 hours Individual- 12.5 hours	National- 8 hours State- 8 hours Individual- 12.5 hours
Paramedic (NR)	Every 2 years	Exam or ConEd	60 hours National- 30 hours State- 15 hours Individual- 15 hours	National- 10 hours State- 10 hours Individual- 15 hours

Table 2: Summary of NR recertification requirements for Emergency Medical Providers.

The national component is composed of courses focused on the topics of airway/respiratory/ventilation, cardiovascular, trauma, medical, and operations. The local/state component includes local and/or state required courses. Where the jurisdiction does not have specified courses, the individual can fulfill the requirement with any EMS-related course approved by the State or Commission on Accreditation for Pre-Hospital Continuing Education (CAPCE). Most flexible is the individual component, which allows for any EMS-related course approved by the State or CAPCE. The various components can be composed of a limited number of distributive education hours as specified in Table 2. NR defines "distributive education" as "a method for delivering EMS education where the educator and student are not able to interact real time. Examples include online courses, journal article reviews, and videos."

Parallel profession- Nurses

State-level CE requirements for nurses by license type, e.g. RN, LPN, etc. was gathered from two web resources: Lipcott NursingCenter (2019) and AAACEUs (2019) and is presented in Table 3. The table shows the hourly CE requirements and renewal frequency for RNs by State.

State	Renewal Period	CE Requirement
Alabama	Every 2 years	24 hours
Alaska	Every 2 years	Must complete two of the following: a) 30 hours of CE, or b) 30 hours professional nursing activities, or c) 320 hours nursing employment.
Arizona	Every 4 years	None
Arkansas	Every 2 years	Must complete one of the following: a) 15 hours of CE, or b) national certification/recertification, or c) 1 credit hour course in nursing with grade C or better.
California	Every 2 years	30 hours
Colorado	Every 2 years	None
Connecticut	Every year	None
Delaware	Every 2 years	30 hours
District of Columbia	Every 2 years	24 hours
Florida	Every 2 years	24 hours
Georgia	Every 2 years	30 hours
Hawaii	Every 2 years	Must complete one of the following: a) 30 hours of CE, or b) board approved refresher course, or c) 2 semester credit hour of post-licensure nursing education from accredited institution.
Idaho	Every 2 years	Must complete two of the following: a) 15 hours of CE, or b) nursing specialty certification, or c) 100 hours of practice, or d) 1 semester credit hour of post-licensure academic education, or e) completion of board-approved refresher course.
Illinois	Every 2 years	20 hours
Indiana	Every 2 years	None
Iowa	Every 3 years	36 hours of CE for renewal of a 3-year RN license; 24 hours of CE for renewal of license issued for less than 3 years or for first renewal after initial Iowa licensure by examination.
Kansas	Every 2 years	30 hours
Kentucky	Every year	14 hours

Louisiana	Every year	5 hours (full-time), 10 hours (part-time), 15 hours (unemployed or working less than 160 hours per year)
Maine	Every 2 years	None
Maryland	Every 2 years	No defined CE hours, but approved refresher course is required
Massachusetts	Every 2 years	15 hours
Michigan	Every 2 years	25 hours
Minnesota	Every 2 years	24 hours
Mississippi	Every 2 years	None
Missouri	Every 2 years	None
Montana	Every 2 years	None
Nebraska	Every 2 years	20 hours
Nevada	Every 2 years	30 hours
New Hampshire	Every 2 years	30 hours
New Jersey	Every 2 years	30 hours
New Mexico	Every 2 years	30 hours
New York	Every 3 years	3 hours of infectious control
North Carolina	Every 2 years	Must complete one of the following: a) 30 hours of CE, or b) 15 hours of CE and 640 hours of active practice, or c) 2 semester hours of post-licensure coursework, or d) national certification or re-certification, or e) board-approved refresher course, or f) 15 hours of CE and completion of nursing project, or g) 15 hours of CE and authoring paper, or h) 15 hours of CE and presenting nursing CE
North Dakota	Every 2 years	12 hours
Ohio	Every 2 years	24 hours
Oklahoma	Every 2 years	Must complete one of the following: a) 24 hours of CE, or b) 520 hours per year of employment in a position that requires an RN, or c) current certification in a nursing specialty area, or d) completion of a Board-approved refresher course, or e) completion of at 6 academic semester credit hours of nursing coursework at the current level of licensure or higher
Oregon	Every 2 years	One-time requirement for 7 hours of CE in pain management; no CE requirements thereafter.
Pennsylvania	Every 2 years	30 hours
Rhode Island	Every 2 years	10 hours
South Carolina	Every 2 years	Must complete one of the following: a) 30 hours of CE, or b) national certification, or c) academic program in nursing or related field, or d) employer verification of competency based on number of hours worked

South Dakota	Every 2 years	None
Tennessee	Every 2 years	No mandatory CE hours; Continued competency is required- must have practiced in last 5 years and meet Board standards of competency
Texas	Every 2 years	20 hours
Utah	Every 2 years	Must complete one of the following: a) 30 hours of CE, or b) 15 hours of CE and 200 practice hours, or c) 400 practice hours for RN
Vermont	Every 2 years	None
Virginia	Every 2 years	Must complete one of the following: a) 30 hours of CE, or b) 15 hours of CE and 640 practice hours, or c) specialty certification by national certifying organization, or d) 3 credit hours of post-licensure education from accredited academic institution, or e) board-approved refresher course, or f) nursing-related practice project or research study, or g) authoring a publication, or h) teaching or developing a nursing course, or i) teaching or development a nursing CE course
Washington	Every 3 years	45 hours of CE and 531 practice hours
West Virginia	Every year	12 hours of CE or b) 6 hours of CE and one of the following: national certification, nursing research project, authored publication, presented professional nursing education, clinical preceptor participation, satisfactory employment for 6 months of reporting period, or approved nursing refresher course.
Wisconsin	Every 2 years	None
Wyoming	Every 2 years	Must complete one of the following; a) 20 hours of CE, or b) nursing practice and CE, or c) 1600 hours of practice in 5 years, or d) 500 hours of practice in 2 years, or e) completion of NCLEX, or f) national certification in specialty area, or g) refresher course.

Table 3: Summary of CE requirements for Nurses.

A license renewal frequency of **every two (2) years** is most common and is required in 43 States. CE requirements with defined hours, or with programs that allow for a combination of fulfillment options including CE hours, are implemented in 36 States and the District of Columbia. Of the 36 States and the District of Columbia, the majority (25 States) only have hourly CE requirements. In those States that allow variable fulfillment options, these options commonly include practice hours, national certification, specialty certification, board-approved refresher

courses, courses through an academic institution, authoring of a publication, nursing research projects, teaching or developing a course, or presenting at a seminar or workshop. There are 11 States that have no CE requirements and 2 States (Maryland and Tennessee) that have no CE hourly requirement but some other form of competency evaluation. Lastly, there is 1 State (Oregon) that has a one-time fulfilment requirement of 7 hours of CE in pain management. Regardless of the absence or presence of defined CE requirements, all States still required license renewal.

Parallel professions- Law Enforcement Officers

The main resource for law enforcement officer CE requirements was Apex Officer (2019), Target Solutions (2019), and Police One Academy (2019). Table 4 shows the hourly CE requirements and renewal frequency for law enforcement officers by State. These hourly requirements do not include de-escalation training or firearms recertification.

State	Frequency	CE Requirement (hours)
Alabama	Every year	12
Alaska	Every year	2
Arizona	Every year	8
Arkansas	Every year	16
California	Every 2 years	24
Colorado	Every year	24
Connecticut	Every 3 years	60
Delaware	Every year	16
Florida	Every 4 years	40
Georgia	Every year	20
Hawaii	None	0
Idaho	Every 2 years	40
Illinois	None	0
Indiana	Every year	24
Iowa	Every 3 years	36
Kansas	Every year	40
Kentucky	Every year	40
Louisiana	Every year	20
Maine	Every 2 years	40

Maryland	Every year	18
Massachusetts	Every year	40
Michigan	None	0
Minnesota	Every 3 years	48
Mississippi	Every year	24
Missouri	Every year	24
Montana	Every 2 years	20
Nebraska	Every year	20
Nevada	Every year	12
New Hampshire	Every year	8
New Jersey	Every year	4
New Mexico	Every 2 years	40
New York	Every year	21
North Carolina	Every year	24
North Dakota	Every 3 years	60
Ohio	Every year	24
Oklahoma	Every year	25
Oregon	Every 3 years	84
Pennsylvania	Every year	12
Rhode Island	None	0
South Carolina	Every 3 years	40
South Dakota	Every 2 years	40
Tennessee	Every year	40
Texas	Every 2 years	40
Utah	Every year	40
Vermont	Every year	25
Virginia	Every two years	40
Washington	Every year	24
West Virginia	Every year	16
Wisconsin	Every year	24
Wyoming	Every 2 years	40

Table 4: Summary of CE requirements for Law Enforcement Officers.

CE is required on an **annual basis** in 30 of 50 States. Only 4 States had no CE requirements. Excluding de-escalation training and firearms training, a large majority of States allowed all or a large percentage of the CE hours to be fulfilled through approved online training classes (Apex Officer, 2019, Target Solutions, 2019, Police One Academy, 2019).

Parallel professions- Teachers

Teach Tomorrow (2019) was the main resource for CE requirements for teachers. Table 5 provides a summarized list of requirements for CE by State. For consistency within the report, those requirements expressed as semester hours or professional development hours were converted to contact hours.

State	License Renewal	CE Requirement (hours)
Alabama	Every 5 years	75
Alaska	Every 5 years	90
Arizona	Every 6 years	180
Arkansas	Every 5 years	60
California	Every 5 years	No State Level Req for hours
Colorado	Every 5 years	90
Connecticut	Every 8 years	144
Delaware	Every 5 years	90
Florida	Every 5 years	90
Georgia	Every 5 years	90
Hawaii	Every 5 years	No State Level Req for hours
Idaho	Every 5 years	90
Illinois	Every 5 years	120
Indiana	Every 5 years	90
Iowa	Every 5 years	90
Kansas	Every 5 years	160
Kentucky	Every 5 years	225[5]
Louisiana	Every 5 years	150
Maine	Every 5 years	90
Maryland	Every 5 years	90
Massachusetts	Every 5 years	150
Michigan	Every 5 years	180
Minnesota	Every 5 years	125
Mississippi	Every 5 years	90
Missouri	Every 4 years	120
Montana	Every 5 years	60
Nebraska	Every 5 years	90
Nevada	Every 5 years	90
New Hampshire	Every 5 years	No State Level Req for hours
New Jersey	Standard license not subject to renewal	No State Level Req for hours
New Mexico	Every 5 years	Variable- Three Tier Licensing
New York	Every 5 years	175

[5] First renewal requires 15 graduate semester hours or one-half of CEO requirements. Second renewal requires completion of a master's degree or completion of CEO requirements.

North Carolina	Every 5 years	80
North Dakota	Every 5 years	90
Ohio	Every 5 years	180
Oklahoma	Every 5 years	75
Oregon	Every 5 years	62.5
Pennsylvania	Every 5 years	180
Rhode Island	No State Level Req for Licensing	No State Level Req for hours
South Carolina	Every 5 years	45
South Dakota	Every 5 years	90
Tennessee	Every 10 years or Every 5 years	90 or 45
Texas	Every 5 years	150
Utah	Every 5 years	Based on PD Plan
Vermont	Every 7 years	135
Virginia	Every 5 years	90
Washington	Every 5 years	150
West Virginia	Every 5 years	90
Wisconsin	Every 5 years	Based on PD Plan
Wyoming	Every 5 years	75

Table 5: Summary of CE requirements for Teachers.

A total of 48 States have licensing requirements of which 45 have CE. The most prevalent cycle for license renewal is **5 years** which is required in 43 States. Tennessee provides the licensee with the option to renew on a 5-year or 10-year cycle.

Survey Results: Parallel Professions

The survey included ten questions:

1) Select your primary career or volunteer role from the list of choices.
2) Choose the type of jurisdiction/district in which you are employed or volunteer.
3) Select the State or Province in which you work.
4) What are you required to do to maintain skills and knowledge proficiency in your profession?
5) How is your continued knowledge, skills, and education training financially supported?
6) How often are you required to complete this training?

7) How many hours or credits of training are you required to complete within the period selected in Question 6?

8) How are you evaluated for knowledge proficiency?

9) How are you evaluated for skills proficiency?

10) Who provides or serves as your testing agency, evaluator, or proctor?

The parallel profession respondents were composed of 45 individuals with the following breakdown: 9 emergency medical providers, 15 nurses, 11 law enforcement officers, and 10 teachers. Most respondents were from city or county jurisdictions. Within their jurisdiction respondents indicated that license or certification renewal was the most common method used to maintain knowledge and skills proficiency. A relatively even distribution of respondents also indicated that refresher courses (58%), online training classes (53%), demonstration of practical skills (60%), on-job drills (51%), and training at professional events (58%) were common methods utilized to maintain knowledge and skills proficiency.

Training was primarily employer funded, however, approximately 50% of respondents indicated that they were required to fund their own training. An annual training requirement was the most prevalent frequency followed by training required every two years. Hourly requirements varied; however, the distribution of respondents was relatively even between 10 to 40 hours.

A written examination was the most common method used to evaluate knowledge proficiency, and practical evaluation was the most common method used to assess skills proficiency. Slightly more than 60% of respondents said that their employer was responsible for evaluating their knowledge and skills.

Survey Results: Fire Service Members

This portion of the survey was completed by a total of 327 respondents composed of 151 firefighters and 176 firefighter/emergency medical providers. Most respondents were from city jurisdictions and were in 43 of 50 States and 2 of 10 Provinces. Within their jurisdiction respondents indicated that license or certification renewal was the most common method used to maintain knowledge and skills proficiency. A relatively even distribution of participants also indicated that refresher courses (73%), online training classes (71%), demonstration of practical skills (68%), and on-job drills (67%) were common methods utilized to maintain knowledge and skills proficiency. As with parallel professions, training was primarily employer-funded, however, approximately 40% of respondents indicated that they were required to fund their own training. An annual training requirement was the most prevalent frequency which is consistent with the data from web-based research. The highest percentage of hourly requirements were in the categories of 40 hours and 80 hours. As was found in parallel professions, a written examination was the most common method used to evaluate knowledge proficiency, and a practical evaluation was the most common method used to assess skills proficiency. Approximately 65% of respondents said that their employer was responsible for evaluating their knowledge and skills with approximately 45% of respondents indicated that their knowledge and skills were evaluated by a State agency.

Data Analysis

Data was analyzed for trends in frequency and hourly requirements within the fire service profession, parallel professions, and a combination of all professions. Utilizing this data, as well as the data gathered from the literature review and survey, the best method for implementation of FEMS knowledge and skills proficiency was established.

Frequency Requirements

Table 6 provides a summary of the most prevalent frequencies for CE across all professions.

	Fire Service-All Positions	Emergency Medical Providers	Nurses	Law Enforcement Officers	Teachers
Frequency	Every year	Every 2 years	Every 2 years	Every year	Every 5 years

Table 6: Most prevalent frequency for CE across all professions.

Of note, however, is the difference between professions and jurisdiction who required recurrent training versus those who required recertification or license renewal. Almost all jurisdictions required licensing for emergency medical providers, nurses, and teachers. This was less common with fire service members and law enforcement officers. Hence, licensing requirements may be related to the longer renewal periods seen in the emergency medical provider, nursing, and teaching professions. As shown in Table 7, Minnesota is the only State that requires license renewal for fire service members.

State	Type	Application	Recordkeeper or Accreditor
Alabama	Annual Training	No	Fire Department
Alaska	Certificate Renewal	Yes	Alaska Fire Standards Council
California	Recertification	Yes	California State Fire Training
Colorado	Certificate Renewal	Yes	Colorado Division of Fire Prevention and Control
Indiana	Recertification	Yes	Indiana Department of Homeland Security, Indiana Firefighter Training System
Iowa	Annual Training	No	Fire Department
Georgia	Annual Training	No	Fire Department- Records made available to Georgia Firefighter Standards & Training Council upon request
Kentucky	Annual Training	No	Fire Department- Records required to be entered into Kentucky Fire Commission Training Records Program

Maryland	Recertification	Yes	Maryland Instructor Certification Review Board, Maryland Fire and Rescue Institute
Michigan	Recertification	Yes	Michigan Department of Licensing and Regulatory Affairs, Bureau of Fire Services
Minnesota	License Renewal	Yes	Minnesota Board of Firefighter Training and Education
Missouri	Recertification	Yes	Department of Public Safety, Division of Fire Safety
New York	Annual Training	No	Fire Department
Ohio	Certificate Renewal	Yes	Ohio Department of Public Safety, Division of Emergency Medical Services
Oregon	Recertification	Yes	Oregon Department of Public Safety Standards and Training
Texas	Certificate Renewal	Yes	Texas Commission on Fire Protection
Utah	Recertification	Yes	Utah Fire Service Certification Council
Vermont	Recertification	Yes	Department of Public Safety, Division of Fire Safety
Wisconsin	Certificate Renewal	Yes	Wisconsin Technical College System, Fire Service Education Office

Table 7: Fire Service Recertification, Renewal and Training Requirements by State.

Most States required certificate renewal or recertification for fire service members which involves an application process that is overseen, typically, by the Accredited Agency. Five States have annual training requirements only; there is no application process and the fire department is responsible for maintaining training records.

Hourly Requirements

In the literature review, it was found that 18 of the 20 States specify hourly requirements. Sorting the data in Table 1 by position type, it was found that only 10 States have requirements which apply specifically to those with a firefighter certification, e.g. NFPA 1001 certification. Table 8 presents the mean, median, mode, and standard deviation for all position types with at least two data points. The mode is listed as "N/A" where it could not be calculated due to an

insufficient number of data points. States with no hourly requirement were removed from the calculation. All the data points were normalized for an annual frequency; the number of CE hours required was divided by the frequency of renewal. For example, Minnesota requires 72 hours of CE every 3 years. This data was normalized to 24 hours of CE per year. At more than 3 times the average hourly requirement, Kentucky's 100 hours of CE per year for career firefighters and Oregon's 60 hours of CE per year for Hazardous Material First Responders and Technicians, were identified as an outlier and were excluded from the data set.

Position Type	N	Mean (hrs)	Median (hrs)	Mode (hrs)	Stdev (hrs)
Aircraft Firefighter	3	39	36	#N/A	20
Driver Operator	2	48	48	#N/A	17
Firefighter	10	28	24	24	12
Fire Inspector	6	15	16	20	6
Fire Investigator	5	18	13	#N/A	11
Fire Officer	4	33	30	#N/A	20
Fire Service Instructor	10	15	8	8	15
HazMat	3	6	8	8	3
Marine Firefighter	2	40	40	#N/A	28
Technical Rescuer	3	35	36	#N/A	26
Wildland Firefighter	3	38	36	#N/A	21
All Fire Service Positions	54	25	20	20	17

Table 8: Descriptive Statistics for Fire Service CE Hourly Requirements by Position Type.

The same analysis was performed using the data collected for emergency medical providers, nurses, law enforcement officers, and teachers. All the data points were normalized for an annual frequency. Figures 1 through 4 present the results of this analysis.

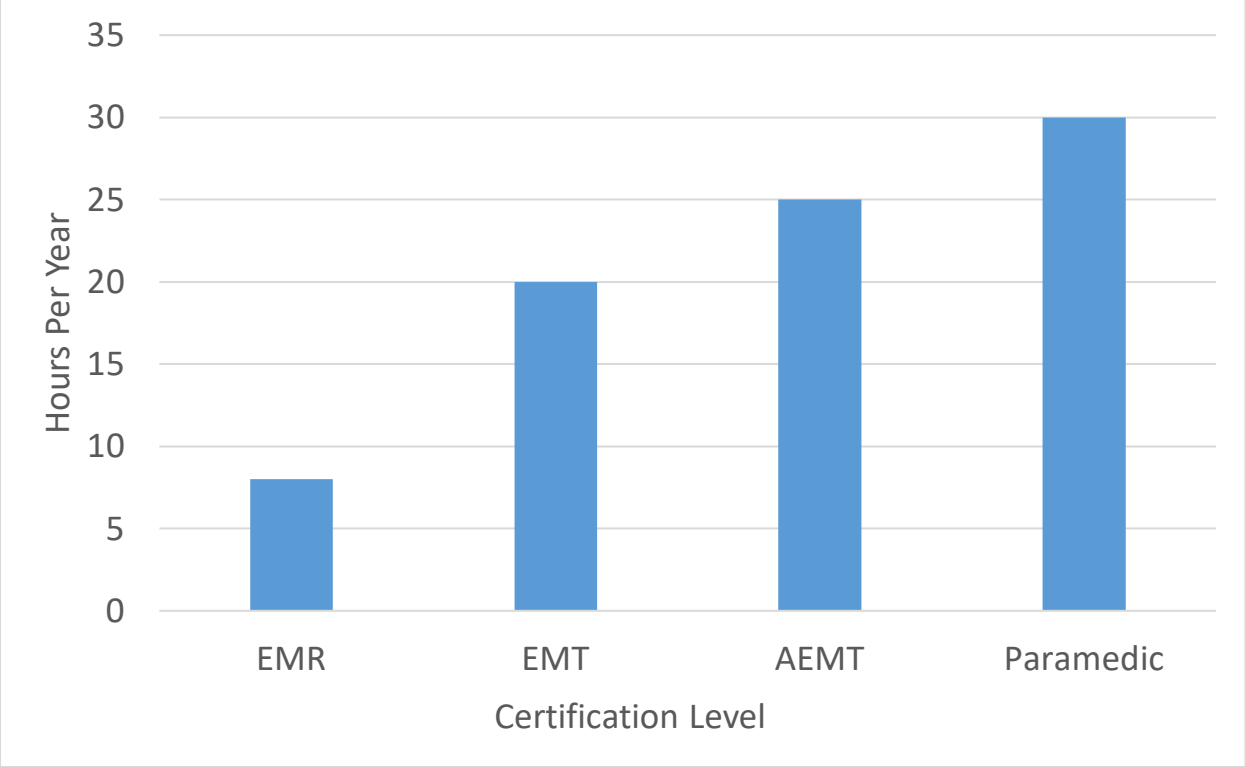

Figure 1: Emergency Medical Provider CE Requirements by Certification Level.

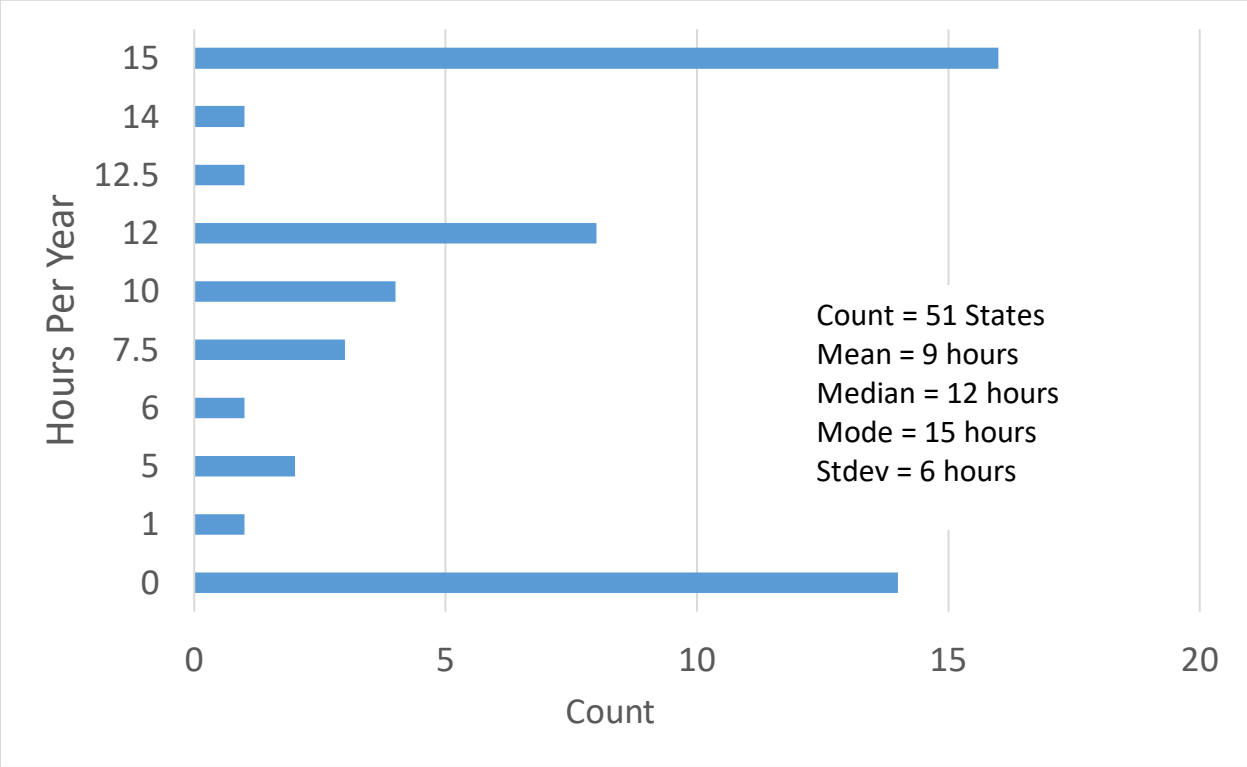

Figure 2: Nursing CE Requirements.

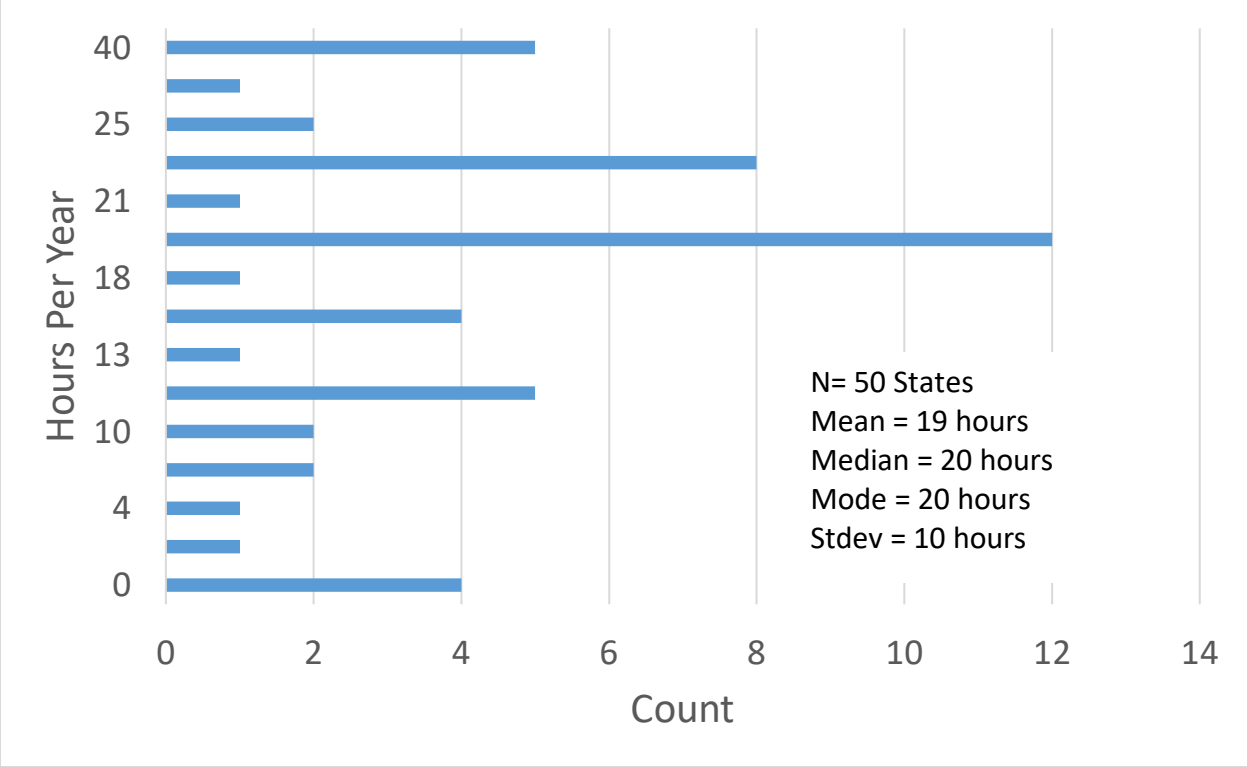

Figure 3: Law Enforcement CE Requirements.

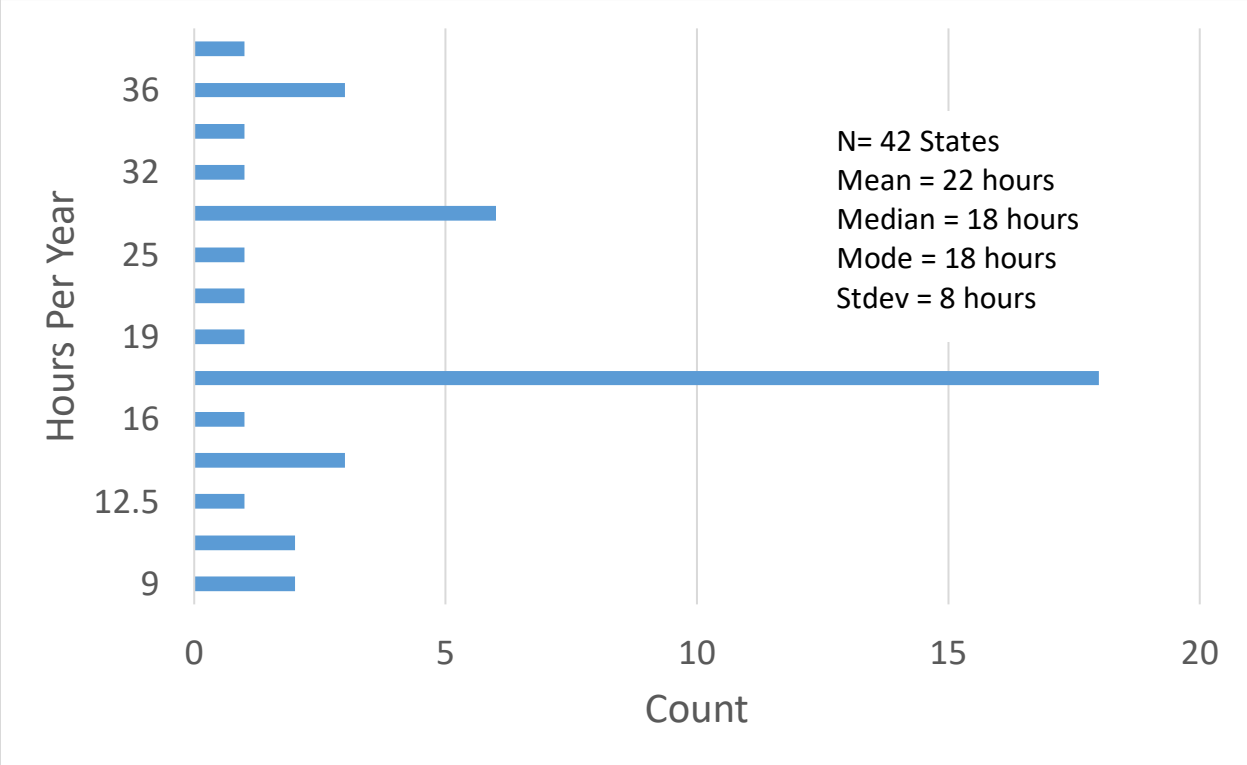

Figure 4: Teaching CE Requirements.

Using the data from Figures 1 through 4, a comparison of descriptive statistics for each data set is presenting in Table 9.

	N	Mean (hrs)	Median (hrs)	Mode (hrs)	Stdev (hrs)
Fire Service- All Positions	54	25	20	20	18
EMR- All Positions	4	21	23	N/A	9
Nurses	51	9	12	15	6
Law Enforcement Officer	50	19	20	20	20
Teacher	42	22	18	18	8

Table 9: Descriptive Statistics Comparison for All Professions.

The comparison shows a common trend across all professions. Excluding nurses, an average of 22 hours per year was required to fulfill CE requirements. The median and mode values are within this range as well. Nursing data was gathered for those with an RN license, which is an entry-level nursing certification. Those with higher level certifications, such as LPNs and NPs, have additional CE requirements beyond those represented in Table 9. Considering all levels of certification for nurses, it is likely that the cumulative hourly requirement would more closely align with that found for the other professions listed in Table 9.

Methods of Delivery

Based upon current practices in the fire service and parallel professions, there are a variety of methods used to support completion of CE requirements. Beyond on-job skills assessments, classroom training, and workshops, some fire departments allow 25% to 100% of training to be completed online. For emergency medical providers, the National Registry accepts State and CAPCE-approved education which can be taken through a combination of colleges, vocation schools, local EMS agencies, online education providers, EMS conferences, and workshops. Additionally, skills verification is required and is typically done through a practicum. Teachers can complete professional development requirements through a variety of methods such as in-

service training, workshops, conferences, and college coursework. Except for hands-on skills evaluations, such as firearms requalification, law enforcement officers can complete most (if not all) of their training on the internet through sources such as Target Solutions or Police One Academy. Many nursing CE programs allow for a combination of work hours, online training, in-person training, and contact hours.

Model Recommendations

Current practices within the fire service, when compared to parallel professions, were given more weight when developing the CE models presented below. Based upon a review of the requirements currently in the NFPA Pro-Qual and Training Standards, NIOSH Line of Duty Death Reports (discussed in detail in McAllister et al (2019)), and current practices in some fire departments in the U.S., it is recommended that FEMS knowledge and skills proficiency be evaluated on an annual basis. Not only is this the most prevalent evaluation frequency being implemented by fire departments across the U.S., but it is the recurrent training frequency required in NFPA 405, 472, 1002, 1006, 1071, 1082, 1404, 1407, 1451, and 1670. An assessment of hourly requirements for all professions (excluding nursing) found an average of 22 hours per year. Focusing specifically on the fire service, it was found that when considering all positions, an average of 25 hours per year was required by jurisdictions. The mode (the most prevalent hourly requirement) was 20 hours per year.

Recognizing the vast array of positions within the fire service and understanding that CE requirements are often linked to a position type, there was a need to focus and better define the scope of the impact assessment. After consultation with the NFPA Research Foundation Technical Panel, it was decided that the impact assessment would focus on individuals with a Firefighter I or Firefighter II certification. The largest population of fire service members possess the NFPA 1001

certification, as it is the basic, entry level requirement largely adopted across the U.S. and Canada. Hence, the fire service would be most impacted by any requirement associated with maintenance of this certification. Table 8 shows that the average CE requirement for firefighter was found to be 28 hours per year with the most prevalent being 24 hours per year. Considering this information as well as the information presented above on parallel professions, a CE model using a 24 hour per year criteria was selected.

A tiered approach was utilized to develop the three models, **Model 1**: Maintain, **Model 2**: Renew, and **Model 3**: Recertify, as shown in Figure 5.

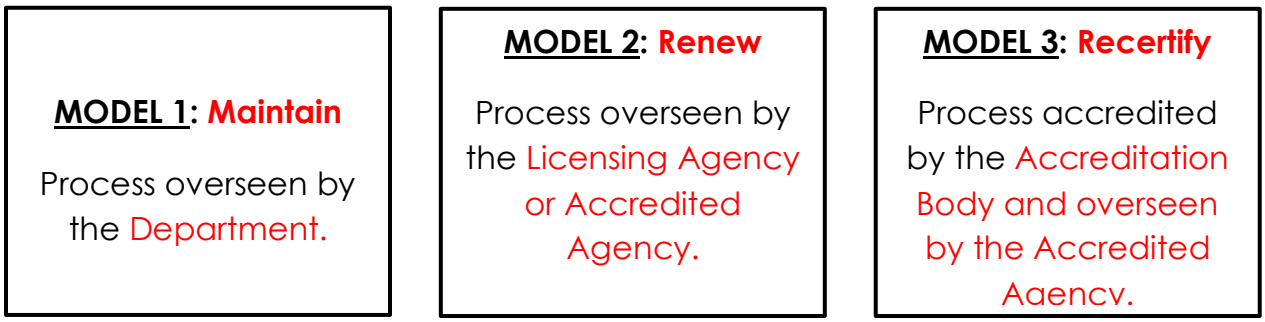

Figure 5: Recommended Models Based Upon Current Approaches in the Fire Service.

Model 1 involves processes like those being utilized by Alabama, Iowa, Georgia, Kentucky, and New York. These States have annual training requirements but no application process for renewal or recertification. In Model 1, the process is managed at the Department level. In some jurisdictions, training records are audited by the Accredited Agency, and courses are approved at the Department level or by the Accredited Agency. Model 2 involves processes like those being utilized by all other States listed in Table 7. Notably, the "recertification" process utilized in some States appears to implement the same methodologies used by other States with a "renewal" process. The process is overseen by the Accredited Agency who defines approved training, requires the submission of an application, and verifies that program conditions have been met. Model 3 utilizes the term "recertification" to mean the reissuance of a new certificate. In this

Model, the Accreditation Body plays the same role in the recertification process as they do in the certification process. Given that Model 2 is the most common approach currently used in the fire service, and after consultation with the NFPA Research Foundation Technical Panel, it was decided that the impact assessment would focus on Model 2, the "Renew" approach.

Other considerations

The challenge in developing a CE program is determining a reasonable approach which will ensure the highest level of skills and knowledge proficiency while minimizing the impact to the Individual, the Department, the Accredited Agency, and the Accreditation Body. With the Individual, consideration must be given to those with multiple certifications; this aspect was not evaluated in the impact assessment survey but should be a focused topic for future work. Each certification includes unique JPRs and annual demonstration of proficiency in all JPRs for each certification held by an individual may prove infeasible. However, to meet the requirements set forth in the current edition of the Pro-Qual standards, those with a certification "shall remain current with the general knowledge, skills, and JPRs addressed for each level or position of qualification."

A Fire Officer at a Captain's rank provides an example of an individual that would have compounding CE requirements. It would not be uncommon for a Captain to have a Firefighter Level II, Driver/Operator, Fire Officer Level II, and Fire Instructor Level II certification. In addition, this individual may possess specialty certifications such as Rescue Technician. In this example, the path to maintaining skills proficiency is less clear. While it may be feasible to include some elements of other certification JPRs in a 24 hour per year requirement for firefighters, all JPR elements for multiple certifications could not be reasonable assessed in this hourly time frame.

As found in Task 1, some jurisdictions focus on the individual's "assigned" role when determining CE requirements to avoid compounding CE requirements. In these instances, the individual is only required to maintain certifications relevant to their assigned role. However, these approaches present challenges for those transitioning between roles or serving in an acting capacity. Additionally, this approach would be unlikely to work for departments which staff stations rather than apparatus. In these departments, assigned roles can change by the call. An officer, driver, and firefighter in a department with a special service, engine, and ambulance, could transition between all three pieces of apparatus within a given shift, requiring them to be proficient in all JPRs associated with those roles.

Another consideration is the Accreditation Body's role in the CE process. In those States that have a "recertification" process for firefighter certification, it is overseen by the Accredited Agency. As such, recertification programs vary from State to State. This is juxtaposed with initial certification which is accredited by the Accreditation Body and thereby standardized from State to State. If managed at the Accredited Agency level, variability in practices across the U.S. could present a challenge to those managing reciprocity programs. One potential solution could be a State-level required refresher course to be taken by the candidate prior to acceptance of their certification.

Conclusions

The purpose of this research was to evaluate the current approaches utilized for proficiency training and CE across the United States and Canada, as well as approaches utilized by parallel professions. Based upon these findings, a CE model was developed. The following is a summary of key findings:

- The current editions of all NFPA Pro-Qual standards requires fire service members to "remain current" with knowledge and skills.
- The need for knowledge and skills proficiency has been expressed in various ways in the NFPA Pro-Qual and Training standards for at least a decade.
- Ten NFPA standards define a frequency for knowledge and skills proficiency; evaluation is to be conducted on an annual basis.
- A total of 20 States have recurrent training, recertification, or license renewal policies, however, only 18 of the 20 States specify hourly requirements.
- Only one State currently requires license renewal for fire service members. Other States required certificate renewal or recertification for fire service members.
- Excluding nurses, an average of 22 hours per year was required to fulfill CE requirements across all professions.
- There are a variety of methods used to support completion of continuing education requirements across all professions including on-job skills assessments, classroom training, workshops, online training, college courses, etc.
- Based upon the findings of the research, it is recommended that a firefighter complete 24 hour per year of training with a minimum of one live fire drill per year.
- The CE training for firefighters should address all the job performance requirements set forth in NFPA 1001.

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Title: Fire and Emergency Service Personnel Knowledge and Skills Proficiency

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Biography

Dr. McAllister is the Founder and Technical Director of FireTox, LLC. Dr. McAllister is also an adjunct professor in the Fire Protection Engineering Graduate Program at the University of Maryland, College Park. Dr. McAllister previously taught fire investigation and mathematics at University of Maryland, University College, fire dynamics and research statistics at Eastern Kentucky University, and fire investigation and fire modeling at the National Fire Academy. Dr. McAllister was also part of the technical committee responsible for the development of fire science courses at the University of Maryland, University College and the National Fire Academy.

Dr. McAllister became interested in the field of fire science when she joined the volunteer fire service in Pennsylvania in 1995. The fire service inspired Dr. McAllister to pursue a degree in Fire Protection Engineering from the University of Maryland, College Park. Shortly after moving to Maryland, Dr. McAllister joined the Beltsville Volunteer Fire Department in Prince George's County, Maryland and served as an active firefighter and EMT. Dr. McAllister later transferred to Morningside Volunteer Fire Department in southern Prince George's County, Maryland where she advanced her firefighting and EMS skills and became the department's first female apparatus driver/operator, Lieutenant, and Vice President. In addition to her firefighter and EMT training, Dr. McAllister is certified as a Hazardous Materials Technician, Rescue Technician (vehicle, trench, structural collapse) and Fire Service Level I & II Instructor. Today, Dr. McAllister still continues to participate in the volunteer fire service in an administrative capacity.

Dr. McAllister is a licensed professional engineer (P.E.), certified safety professional (C.S.P.), and certified fire investigator (C.F.I) and has investigated hundreds of fire and combustion related incidents over the last two decades. In addition to her bachelor and master in Fire Protection

Engineering, Dr. McAllister has a PhD in Forensic Toxicology from the University of Maryland, School of Medicine and specializes in fire death investigation and the development and instruction of fire death investigation training. Dr. McAllister has led and participated in numerous research projects funded by the National Research Council of Canada, the National Institute of Justice, the Department of Defense, and the National Institutes of Health. Dr. McAllister has participated on numerous code development committees, either as a formal member or friend, including NFPA 921, NFPA 720, and ISO TC 92/SC3.

Dr. McAllister has presented her training and research at numerous scientific and technical conferences for organizations such as NFPA, SFPE, and IAAI. Her work has also been published in numerous technical, peer-reviewed journals including Fire Technology, Journal of Analytical Toxicology, and Forensic Science International. She has also authored chapters in *Health Effects from Combustion Products*, the *SFPE Handbook*, and the *SFPE Guide to Human Behavior in Fire*.

Brian McAllister

Mr. McAllister is a co-owner and researcher at FireTox, LLC. Mr. McAllister has been involved in the field of fire science since joining the volunteer fire service in 1989. His passion for firefighting led him into the career fire service in 1998 as a federal firefighter at the Marine Corp Logistics Base in Albany, GA. Mr. McAllister was subsequently hired by the District of Columbia Fire Department in Washington D.C. in 2001 where he currently holds the rank of Captain. In addition to his experience in the fire service, Mr. McAllister previously worked as a fire science technician. In this position, he gained experience in fire origin and cause investigation and fire research and development. In addition to all required basic level fire department and EMS certifications, Mr. McAllister is a certified Hazardous Materials Technician, Rescue Technician (vehicle, trench, confined space, structural collapse, rope specialist), ARFF, Fire Service Instructor I & II, and Fire Officer I, II & III. Mr. McAllister also holds a Bachelor of Science in Fire Science from the University of Maryland.

As a company commander, amongst other things, Mr. McAllister is responsible for evaluating company training needs, establishing company level training schedules, and performing hands-on training with personnel. Mr. McAllister is well-versed in FEMS knowledge and skills proficiency requirements and the challenges faced by departments in implementing these requirements.