

TUCSON COLLABORATIVE COMMUNITY CARE REDUCES 911 CALL VOLUME

IN TUCSON, AZ

By

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## Abstract

One of the biggest costs that emergency departments face, and a large contributing factor to EMS-provider burnout, across the nation is the provision of non-urgent care to patients who would have been better served by a primary care physician or other community resource. And Tucson, AZ, is no exception. Due to this, numerous programs have emerged throughout the country with the goal of reducing non-emergent use of emergency services by enlisting the help of firefighters, nurses, paramedics, and behavioral health specialists (recruited specifically for this purpose) to ease the burden on other EMS crews. Tucson Collaborative Community Care (TC-3) is modeled after this newly-emerging philosophy of community paramedicine. This study was designed to evaluate the efficacy of the TC-3 program at reducing 911 calls in the Tucson community. The analysis was also broken down to identify the primary physiologic and pathologic complaints that result in frequent 911 calls. We used a paired T-test to analyze the call volume for 157 subjects in order to determine the significance of the number of 911 calls one year prior to the case closure versus the number of calls one year post-closure. Our results demonstrated that the program was overall effective at reducing non-emergency EMS calls with a p-value of 0.030. However, the program didn't produce a statistically significant reduction within the specific categories (with the exception of Area of Concern: Age-related Concerns).

## Introduction

One of the biggest costs that emergency departments (ED) face across the nation - from level 1 trauma centers to small, remote hospitals - is provision of non-urgent care to patients who would have been better served by a primary care physician. A 2010 study by the RAND corporation found that between “14 and 27 percent of all ED visits are for non-urgent care” (Garcia & Hendrickson, 2010) and if those visits had taken place in an alternate setting, such as a physician’s office or after-hours clinic, the potential cost savings would be approximately \$4.4 billion annually. The majority of these costs stem from a disproportionately small number of individuals. A study published in the Annals of Emergency Medicine in 2010 found that “frequent users comprise 4.5 percent to 8 percent of all ED patients, yet account for 21 to 28 percent of all visits” (Garcia & Hendrickson, 2010).

Recently, there have been numerous programs throughout the country targeting this problem with the goal of reducing non-emergent use of emergency services. Tucson Collaborative Community Care (TC-3) is modeled after this newly-emerging philosophy of community paramedicine (CP). These programs are often extensions of community fire departments, since firefighters respond to a large range of EMS calls from the community, from medical emergencies to aging citizens requiring help with a task (O’Meara, et al., 2016). The goal of CP workers is to reduce the volume of non-emergent calls so that EMS crews can direct their focus on true emergencies. CP workers often work directly with struggling community members to help them navigate community services like primary care, mental health or substance abuse treatment centers, or in-home living assistance, depending on their needs. A community paramedic in a brief study by O’Meara et al. explained the role as “we’re connectors... We don’t fix their problem with medical skills. We connect them to the resources they need so they don’t become a medical emergency” (O’Meara et al. 2016).

While TC-3 is loosely based on the community paramedicine model, it branches off in a few significant ways. Traditional community paramedicine relies on expanding the roles of paramedics in the field, allowing them to provide a broader range of social and medical care. Contrastingly, TC-3 designates specific providers for this expanded care role. Instead of paramedic crews directly providing additional services, in the TC-3 model, field crews direct individuals in need of expanded services to a specialized team of firefighters, paramedics, nurse navigators, behavioral health specialists, and an extended support staff (which include personnel from both Tucson Fire and Tucson Medical Center, as well as volunteers) (City of Tucson, 2021). This team then handles the organization and delegation of further care. The TC-3 team remains in contact with the client until they no longer express a request for assistance. This specific model aims to prevent burnout of first responders by delegating care of underserved community members in order to limit the scope of practice for EMS crews to emergency responses only instead of expanding the scope of care that they are expected to provide (McDonough, 2020). The goal of this study was to evaluate the efficacy of the TC-3 program at reducing 911 calls in the Tucson community. Along with overall efficacy, the analysis was also broken down to identify the primary physiologic and pathologic complaints that result in frequent 911 calls.

Common issues that TC-3 provides assistance with are: diminished mobility and fall-risk in elderly individuals, inability to complete activities of daily living independently, drug/alcohol abuse, and individuals suffering from mental illness. However, given that ~64% of TC-3's clients are over the age of 65 years, falls and fall-related injuries are one of the most prominent issues that TC-3 addresses (Tucson Fire Department & Tucson Medical Center, 2020). Fall risk increases with age as individuals begin to lose strength, balance, mobility, and coordination.

According to the CDC, about 36 million older adults fall each year and 3 million of those individuals are treated in emergency departments for a fall injury (CDC, 2020). TC-3 has responded to approximately 272 clients deemed “high-fall risk” since its inception in 2016. In the past couple years, these clients alone have generated upwards of 650 calls to 911 (though this is likely a very low estimate). The primary physiological effects of aging that result in increased fall risk can be attributed to changes in the musculoskeletal system. In the skeleton, declining estrogen and androgen levels in females and males, respectively, increases bone turnover rate. The combined relationship between bone resorption and formation triggers an increase in osteoblasts, however, the increase in the bone formation rate isn’t sufficient to match the destruction by overstimulated osteoclasts (Roberts, et al., 2016). In terms of skeletal muscles, the loss of muscle mass begins during middle-age and occurs at a rate of ~1%/year. More significantly, muscle function (e.g. using strength-related performance as a proxy) is lost even more rapidly than muscle mass. Longitudinal studies have shown that at aged ~75 years, strength is lost at a rate of 3-4%/year in men and 2.5-3%/year in women (Wilkinson, et al., 2018). Loss of strength has been linked to numerous physiological impacts including the inability to successfully live independently, frailty and increased risks of falls, increased risk of chronic diseases, and increased risk of all-cause mortality (Wilkinson, et al., 2018).

Fortunately, there are many effective fall prevention strategies that can be implemented for at-risk individuals. As part of the TC-3 program, educators regularly host community awareness events to enlighten older adults on the factors that can contribute to falls and strategies to mitigate those risks (such as removing loose carpeting and rugs, ensuring all rooms are well-lit, and the importance of exercise to build and maintain strength and balance). Along with home modification, regular and adequate exercise is highlighted as a fall prevention strategy.

Neuromuscularly, exercise helps to maintain cognitive function and may also help maintain the number of peripheral motor neurons controlling leg muscles. Physical activity also improves balance and coordination to reduce risk of falls, and should a fall occur, older adults who exercise regularly - particularly activities that include higher impacts - are less likely to experience a bone fracture because their bones are stronger and have higher bone mineral density (McPhee, et al., 2016). Additionally, TC-3 partners with PMHDC Southwest Medical Aid (PSMA) to provide durable medical equipment - walkers, shower chairs, grab bars, etc - to individuals deemed high-fall risk. Appropriate aids can assist with mobility and the ability of aging individuals to live safely and independently. The hope is that prevention programs such as these will further contribute to the reduction of EMS calls by giving at-risk individuals the knowledge and tools to avoid becoming high-frequency callers.

### Methods

We gathered data from TC-3 cases closed in SmartSheets between January 1, 2020 and December 31, 2020. In terms of exclusion criteria for this study, we excluded TC-3 clients experiencing homelessness due to the necessity of having an address in order to track 911 call volume. We also excluded clients who died during the TC-3 intervention period or within the one year period following cessation of TC-3 intervention. Intervention began when Tucson Fire crews referred an individual to TC-3. Following the referral, a TC-3 navigator would reach out to the client in order to gauge their situation, reasons for over-utilizing the 911 system, and how to begin moving forward to assist the client. TC-3 interventions included: setting clients up with community programs such as Pima Council on Aging (PCOA), Adult Protective Services (APS), and behavioral health services like Community Bridges, inc (CBI). Other partners include durable medical equipment suppliers, meal delivery, and medical services like El Rio Health

(Tucson Fire Department & Tucson Medical Center, 2020). Intervention was considered complete when 1) the client refused the continuation of TC-3 services, or 2) the client was utilizing other resources and no longer calling 911 for non-emergency reasons.

We initially had 179 data points. However, we excluded 22 subjects due to missing addresses and ultimately analyzed the call volume for 157 subjects. We used SPSS Statistics to determine the significance of the number of 911 calls one year prior to the case closure versus the number of calls one year post-closure. “Year prior” and “year post” were the dependent variable, and the change in call volume (calculated as the number of calls pre-closure minus the number of calls post-closure) was the independent variable. Data was analyzed for all of the following groupings: overall efficacy, male versus female, age, zip code, and area of concern. Note, “overall efficacy” refers to the reduction in call volume for *all* TC-3 clients (regardless of age, sex, area of concern, etc). This was measured by noting the case closure date for each client in 2020, then recording their call volume in the one year prior to that date and their call volume in the one year after the closure date (e.g. for a case closed on Jan. 1, 2020, the pre-closure call volume would include any EMS calls from Jan. 1, 2019 to Jan. 1, 2020 and the post-closure volume would include all calls from Jan. 1, 2020 to Jan. 1, 2021).

**Results**

<b>Group</b>	<b>p-Value</b>
Overall Efficacy	0.030*
Sex	0.665
Age	0.276
Area of Concern: Age-related Concerns	0.032*
Area of Concern: Medical	0.165

Area of Concern: Substance Abuse	0.281
Area of Concern: Behavioral	0.115
Zip Code	0.723

\* denotes a significant p-value

A 69.5% decrease in the average call volume per TC-3 client post-intervention was observed, with a significant p-value of 0.030. More specifically, the following decreases in call volume were observed within the specific categories (however none of the decreases, besides “Area of Concern: Age-related Concerns”, were considered significant according to the T-test we performed):

<b><u>Categories</u></b>	<b><u>% Reduction in Call Volume</u></b>
Male	69.9
Female	76.0
Under 50 y/o	61.1
51-60 y/o	81.5
61-70 y/o	53.8
71-80 y/o	74.7
Over 81 y/o	70.8
Age-related Concerns	69.0
Medical	75.9
Substance abuse	85.5
Behavioral	59.6
85701	100**
85705	57.7
85706	65.2
85710	73.3



85711	86.9
85712	52.6
85713	58.7
85714	18.4
85715	71.7
85716	88.1
85718	87.5**
85719	89.4
85730	60.6
85745	52.9
85746	85.7**
85747	82.4**
85748	81.0**
86756	33.3**

\*\* denotes an n-value less than 5

Discussion

Although every category demonstrated a reduction in the average call volume per client after receiving TC-3 assistance, none produced a statistically significant decrease besides “Area of Concern: Age-related Concerns” (which had a p-value of 0.032). In other words, this study does not support the idea that focusing TC-3 resources on particular groups (females, clients under 50 years of age, clients with medical concerns, etc) would increase the efficacy of the program to a statistically significant degree. The only exception to this may be clients experiencing issues related to aging (such as falls, inability to complete activities of daily living alone, etc). One source of error in this study may have stemmed from the extremely small sample

size within some categories. This could be attributed to multiple reasons, including, 1) the tendency of certain crews to refer individuals to TC-3 more often than other crews (thus skewing the number of clients within a particular station's area/certain zip codes), or 2) a larger percentage of individuals within certain groups may refuse TC-3 intervention after receiving a referral, meaning that they're still generating high-volume 911 calls but are not being included in TC-3's clients/data. Furthermore, some calls may have been inadvertently excluded due to incorrect addresses when the call was reported which would have skewed our pre- or post-intervention call volume for some clients. Future extensions of this study could include analyzing the data for a larger time frame in order to increase the number of subjects in each category (e.g. analyzing call volume over a three-year period instead of a single year).

Additionally, analyzing the data for a significant correlation between average client income and the efficacy of TC-3 intervention could help locate higher-risk individuals as well. This could potentially be done through either obtaining mean household income for each TC-3 client, or by distinguishing the average income per zip code and assessing client call volume patterns within each zip code.

### (Conclusion)

Overall, our data analysis demonstrated that the Tucson Collaborative Community Care (TC-3) program is effective at decreasing non-emergency 911 call volume. This was shown by a significance value of 0.030. However, we did not see a significant decrease in call volume per the majority of individual categories (the exception being Area of Concern: Age-related Concerns, which had a significance value of 0.032). This suggests that the needs of TC-3's clients are widely varied and focus cannot easily be narrowed down to a single client type or

need in order to continue successfully assisting those in need in the Tucson community. A primary focus of future studies should be on analyzing a larger sample size for all categories. Other extensions to this study could include analyzing other subcategories of TC-3 clients (such as how mean income influences the effectiveness of TC-3 intervention, or if the positive impact of TC-3 extends beyond individual clients to community organizations by looking at trend changes in hospital transports).

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