



AHP Method for Selecting the Best Strategy to Enhance Safety Culture: A Case Study at “XYZ” Company in Qatar

Cece Hadian^{1*}, Kholil² and Syahfirin Abdullah²

¹Magister Program of Occupational, Health, Safety and Environmental, Post Graduate Program, Sahid University Jakarta, Indonesia.

²Post Graduate Program, Sahid University Jakarta, Indonesia.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Lack of safety culture awareness in the ambulance services affects not only locally but internationally in different countries, including at "XYZ" a company in Qatar. Many studies mentioned about risks and hazards associated with ambulance services that result from illnesses, accidents, or property damaged because of a lack of safety culture. The results of the safety culture survey in ambulance service of XYZ Company were showing less of commitment and involvement of ambulance personnel to safety 52.6% and less motivation 57.9%. It supports by the achievement of key performance index of ambulance services that was 85 % – 96 % from the target. This paper discussed a strategy to improve safety culture in ambulance services. The authors conducted a research study utilizing the AHP method to select the best approach by following the real condition. This study compares the essential factors in improving safety culture based on eight criteria and three strategies safety climate which the result shows that (a) The commitment of senior

*Corresponding author: E-mail: cecehadian@gmail.com;

management with a value of 0.247 or (247%), and (b) Operational approach strategy with a value of 0.386 or (38.6%), with CR of 0.03 are among the top priorities needed in the operational of ambulance services to run optimally.

Keywords: *Safety culture; ambulance service; AHP.*

1. INTRODUCTION

Indicators of a good safety culture in an organization can result from various factors like as good safety commitment from top management and employees, compliance with policies and regulations, quality services and professionalism or the existence of a safety system in the organization but most of the people will see from the number of accidents and illnesses that occur in the organization [1]. p.355]. Safety concerns in ambulance services are mandatory, failure to do, it will be led the incident and accident into the ambulance personnel and patients [2].

Commonly, factors are causing failure to provide high quality and excellent safety performance in ambulance services such as physical and psychological condition, professionalism, motivation and competence, work environment, weather, coworkers, policy and finance problem. Pattersen et al. [3] states, in addition to physical risks, EMS personnel also experience psychological risks. Many EMS personnel violate in written regulations, failed on procedures, stress, felt insomnia and exhausted and have no commitment to the profession [4]. Uncontrolled and unpredictable environmental conditions, lack of supervision, limited information and uncertainties that often linked as factors that contribute to increased safety risks for patients in EMS services [5].

According the data NHTSA agency period of 1999-2011, the number of accidents or collisions related to ambulance every year is around 4500 cases, 34% resulted in injuries and 33 people died. 4% were ambulance drivers dead, 21% were ambulance passengers, 63% were passengers from other vehicles and 12% were pedestrians [6]. In Western Turkey, "The most accident happens in ambulance service was motor vehicle accident (MVA) 31.9%, needle-stick injuries 16.0% [7]. In Taiwan had been 1,627,217 traffic accidents during the study period, 715 involved the ambulance within 8 fatality and 1844 injured patients [8]. My impression to those incident and accident, due to the lack of the safety culture in ambulance

service, it was the high-risk incident and accident and harmful to ambulance personal and patient.

Similarly, it also happened in the ambulance service at XYZ Company. In the 2013-2018 period, there were 4833 emergency calls, Two thousand six hundred fifty-six calls (55.5%) were related to patient management, and 45% non-related. One hundred seventeen cases (4.4%) were traffic accidents, 424 (16.0%) cases of trauma or injury, 2098 cases (79.0%) were medical, and 17 cases (0.6%) were dead on arrival [9].

Based on data from occupational health (OH) clinic period of 2016 - 2018, there were 3 cases of ambulance personnel suffered low back pain and spinal cord injury due to faulty in lifting, 1 case of small head injury and 1 case of heat exhaustion. Presentation by Al-Jaidah, [10] mentioned, "Number of sick leave during 2017 was high. OH recorded, 1.55% (544 days) of health workers including ambulance personnel submitted sick letters".

On annual report 2018 of safety performance reported, participate of providing incident or accident says in the health department of XYZ Company, especially ambulance services, was deficient. It was 16 reports during the 2013-2018 period ref. 90% are related to patient management, and 10% similar to safety issues; unexpected events (KTD) and near misses (KNC).

The National Patient Safety Agency, [11] in Wankhade & Jones, [4] mentions complex problems in the provision of ambulance services and related processes, as risk factors for quality service failures. The risk and hazard in ambulance service are difficult to avoid because of the environment condition and the nature of work itself, but it can be reduced or minimized as little as possible by efforts to enhance occupational health and safety system with increasing promoting strategy through the development of a safety culture in the work environment.

Based on the description above, the author is interested in researching the strategy to enhance safety culture at the ambulance service of the XYZ Company in Qatar. The primary purpose of this research is to analyze existing problems, formulate priority strategies and build up a model for strengthening the safety culture in ambulance services at XYZ Company. Building a safety culture in ambulance services or organizations is fundamental. A positive safety culture influenced by organizational performance and safety management performance.

2. LITERATURE REVIEW

In the United States of America or most Europe countries, ambulance services were called Emergency Medical Services – EMS [12]. EMS is an ambulance service system in terms of emergency services integrated in terms of facilities, professional personnel and management systems that are standardized both nationally and internationally [12]. Principally, EMS practitioners have some responsibility as well as another health practitioner in the hospital to provide established high-quality health services to the patient but more focus on pre-hospital management before the patient sends to the hospital [12].

To maintain and improve the care of patients, systematic documentation and periodic audits, or other processes to ensure the quality of care, need to be incorporated, "Quality management systems that are simple, are continuous, and allow for rapid changes in the system need to be implemented" [4]. The safety and quality management in the ambulance became a priority and essential because a lack of supervision in safety will be led to an accident, loss of property damage, social problem and protection for the personnel and patient. The Berwick Report [13] in Pettersen, et al. [3] explained, what steps to be required to improve patient safety: "Identifying that incorrect organizational priority, systems, environmental factors, and culture were contributory factors in failing to learn and in failing to protect patients from harm". The management of quality risks within ambulance services presents significant challenges due to the unique environment they operate within [14]. In this view, we should eliminate the risk factors and enhancing the safety culture in the ambulance to maintain the services and protect all parties involved in ambulance services, including personnel and patient.

What is the safety culture means and how's to enhance safety culture? Confederation of British Industry [15] defines "culture" is the way we do things around here". Stranks, [1] described as "a state of manners, taste and intellectual development of mind, tastes, etc. by education and training." The Department of Mine, Industry Regulation and Safety of Western Australia defined "the safety and health culture of an organization is a reflection of the values, attitudes, perceptions, competencies, and behaviors of the people working there [16]. It reflects the organization's commitment to, and prioritization of, safety and health as well as the effectiveness of the organization's safety management system [1]. The elements of a safety and health culture organized into three categories: a) Organizational. It includes policies, procedures, and systems that relate to safety and health. b) Psychological, involving individual perceptions, attitudes, and values. c) Behavioral, what people do, health, and safety behaviors [17]. King [18] Identified two distinct while developing a safety culture within the organization: a) A transformation of systems, leadership, and organizational culture. b) The administration created the conditions in which high standards of care are delivered consistently, setting clear goals and standards for improving quality and patient safety, and providing the tools for staff to address these goals within available resources.

In building a safety management system in adhering to a high quality in the ambulance service based on the enhancement of safety culture within the organization, there is some indicator that needs to follow. The cultural symbols utilized in many aspects of activities found within the organizations [1]. It is how to measures specific features of a particular culture of the people or group of the people when they are doing communication, transaction, or other business [17]. Stranks, [1] on human factors and behavior, safety said: "cultural indicators linked with Key Performance Indicators (KPI) and Success Criteria (Acceptance Criteria)." Within an organization, cultural indicators include a) Degree of loyalty and commitment displayed by all levels of the workforce. b) Presence of shared goals with specific signs. c). Policies and procedures. d) Evidence of fair and effective management systems. e) Investment in people (Training, frequent information) f) Investment in Technology. g) Compliance with a legal requirement. Personal integrity at all levels.

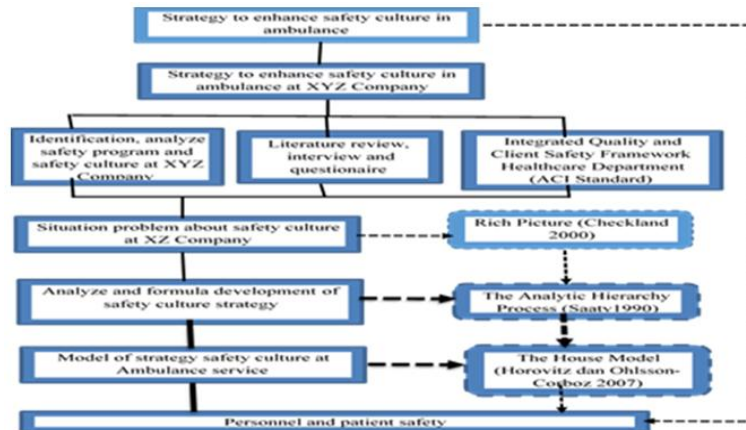


Figure 1.1: Theoretical framework of strategy to enhance safety culture at ambulance service in XYZ Company Qatar

h) System for communication both within and in our organization. i) A well-written mission statement. And j) A publicized reward structure that rewards high levels of performance. The organization operational and safety performance will influence those indicators. The indicator shows, the critical thing of build up a system and human resources as well to get a positive culture in the workplace and it is the best way to have greatest impact on the reduction of accident and ill health (1.p.355). In the meantime, in the context of ambulance operational, the commitment from executive or top management are very significant because it is related to vision and mission, value, financing, and build up a system [4].

3. METHODS

This type of research is conceptual research, which is research related to an idea or theory that might be applied, with a system approach. The theoretical research that the researcher did was a concept, design, or strategy to improve safety culture at the ambulance service of XYZ Company in Qatar. The study conducted from March 2019- up to July 2019 at XYZ Company.

Descriptive analysis is used to analyze data by describing the data collected without the intention to create a generally applicable conclusion — the systematical data found by interview results, observation, documentation, and survey. Descriptive analysis was used to describe problems, risk factors regarding safety culture at ambulance services of XYZ Company. After the study results well explained, the problematic situation described with Rich Picture.

In this research, the author compiles primary and secondary data. Primary data collected with the observation method, in-depth interview with the expert, who directly concerns in enhance of safety culture in the ambulance services. In this research, choosing the experts are used non-probability method and to collect data are used purposive sampling technique. The primary data is used to obtain the information, assessment quality, objective, and measurement of formulation strategies for enhancing safety in the ambulance services of XYZ Company. The rest, secondary data taken from internal data of XYZ Company, statistic, and yearly report, books, relevant websites, thesis, and the related journals.

Data analysis methods used in this research were descriptive analysis, utilization of questionnaire safety culture as tools analysis with SPSS25, Soft System Methodology based Rich Picture [19], AHP Saaty & Vargas, [20] in Kholil, [21] and The House Model, [22]. By using AHP, the best choice according to the objective condition determined [23]. The judgment from experts were analyzed and arranged appropriately by Expert Choice 2.0 software [24] and presented with the house model. In this research, five experts were involved. The expert for this research was two ambulance practitioners at XYZ Company, one direct supervisor from management, one from business, health and quality section (BHQ) as an auditor and one academican including practicing in occupational and health and safety. The AHP process seen in Figure 1.2.

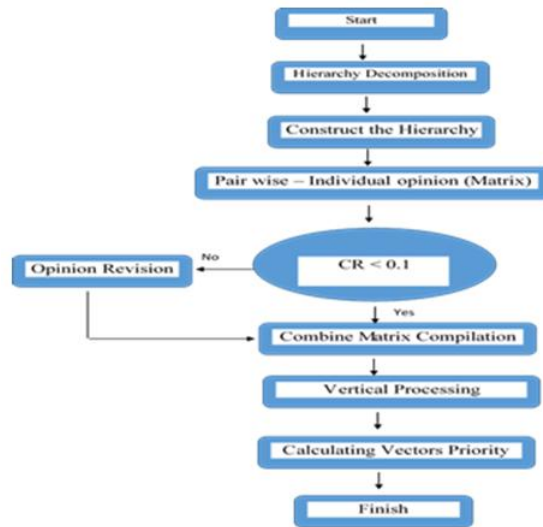


Figure 1.2: AHP Process

3. RESULTS AND DISCUSSION

3.1 Brief View of OH&S Program and Safety Culture at Ambulance Service in XYZ Company Qatar

The XYZ Company is engaged in oil and gas. As a state-owned company with international tenure, the viability of a safety management system in the company mandates and must be in operation. One standard that must be met by the company is to provide a plan and emergency response system to deal with emergency conditions and situations. Ambulance service is one component in the emergency response system. The ambulance service at XYZ Company operates 24 hours, 7/28 with a fleet of 4 units with a total of 39 personnel from several different countries. Operationally, the ambulance service provides emergency services for all employees in the industrial area, neither for XYZ

employees itself nor contractors and subcontractors.

Officially, the company have been received ISO 9001-2015 and ACI "Diamond" Level (Accreditation Canada International) for Quality services, but not yet synchronized with implementation at ambulance services.

Management's commitment to safety seen in the form of the BHQ division (Business, Healthcare, and Quality). "The BHQ team is responsible for the direction and implementation of the management functions of compliance with procedures, service quality, health risks in the work environment of the company clinic and ambulance". The focus and responsibilities are "on improving quality, effective health risk management and compliance with national health regulations to improve the health values of XYZ companies and employees following health terms and standards, good service and cost-effectiveness."

Table 1.1. ACI – accreditation Canadian international program

Category	Goal
Safety Culture	Building a culture of safety in the company
Communication	Improve communication and coordination in services and service providers and service recipients
Medicines Dispensing	Make sure you use drugs at risk
Work Environment	Establish a safe place and work environment in providing services
Infection Control	Decreases and minimizes the risk of disease due to service to service personnel
Risk Analysis	Identify risks to clients and employees

Source: ACI manual book 2018 XYZ Company

OH & S's Company strategies and objectives are as follows:

- a. Improve the performance of the health system and service delivery (ensuring the reach of health services that are accessible and sustainable according to the needs of XYZ company employees and work partners and other stakeholders).
- b. Safety, quality and client satisfaction (providing integrated, safe, high-quality health services to improve the physical and mental health and well-being of clients).
- c. Occupational health services and collaborative support (providing world-class occupational health services for XYZ company employees and collaborative support to internal and external stakeholders).
- d. Professional development (ensuring and maintaining a competent workforce through the development of sustainable professionalism).
- e. Efficient business processes and financial systems with integrity (ensuring financial integrity through the implementation of efficient business processes).

4. DATA FINDINGS AND ANALYSIS

4.1 Analysis or Description of the Problem Situation in the XYZ Company Ambulance Service

In general, the Safety system and program in the XYZ Company are excellent, but the implementation in the field still needs to be improved. Based on the result of the safety culture survey, it showed in Table 1.2.

Based on Table 1.2, the highest value is a management commitment criterion with an average score of 9.44 while the lowest cost is a motivation criterion with an average rating of 8.31.

Based on the Table 1.3, comply with policy and procedure have the highest rating with a value of 73.7%, while employee involvement was the lowest value with a value of 52.6%.

This is supported by internal data which is the key to the work performance of the ambulance unit (KPI). In this case, it can be seen with unsatisfactory achievements from the patient handling report of 94% during 2018. Even though reporting on services to patients is fundamental as the legality of all actions that have been done.

Likewise, the value of the reporting index of pain scale and response time were 96%.

4.2 Rich Picture (RP)

In this stage, identify the problem as a problematic situation known from the culture of the safety of ambulance services at the XYZ Company. Problematic situations aim to explain clearly about issues in the real world. The process at this stage is essential because it is related to the decisions of experts. After the results of the analysis concluded, the next process illustrated by drawing for explaining the situation in the real world See, Figure 1.3.

4.3 Formulation of Safety Culture Improvement Strategies at Ambulance Services at Qatar XYZ Company

According to Expert's judgment towards 8 criteria's and 3 strategies proposed in the effort to enhance safety culture at ambulance service in XYZ company, there were 3 main factors that get individual attention, namely: commitment of senior management is the most critical factor with a value of 0.247 (24.7%), followed by employee commitment and involvement with a value of 0.181 (18.8%) and compliance with regulations and existing procedures with a value of 0.140 (14%). The Expert's argued: *"Commitments with a clear vision and mission from management and a good system improvement on OH&S will spur organizations and employees to always comply with OH&S."* The synthesized result is seen in Figure 1.4.

The result of this research is in line with previous research from Price, [5]; Pattersen, et al. [4] & Ernawati, et al. [25] They mentioned, "The risk factors that causing various hazards in the ambulance service environment, it came both internally and externally such as destitute of the systems, no organizational commitment, lousy culture, inadequate safety facilities and infrastructure. It is also because of procedures that do not meet standards, stress, lack of knowledge, training and motivation, conditions of work and weather climate". This study supported by Attack & Maher, [26] on Perception of EMS personnel and health workers on safety issues in the pre-hospital service, they suggested, more active participation of EMS personnel to improve skills, clinical decision making and the necessity for changes in the regulations and health systems in the regions and the government, in the effort to enhance the safety of the patient.

Table 1.2. Descriptive analysis result**Safety culture at ambulance services in XYZ company qatar**

Criteria	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference	
				Lower	Upper
Management Commitment	9.4474	1.13179	.18360	9.0754	9.8194
Communication	9.0526	1.48774	.24134	8.5636	9.5416
Employee Involvement	8.5000	1.42847	.23173	8.0305	8.9695
Training & Information	9.3947	1.15172	.18683	9.0162	9.7733
Motivation	8.3158	1.71015	.27742	7.7537	8.8779
Comply with Policy & Procedure	8.8947	1.87140	.30358	8.2796	9.5099
Learning Organization	9.2105	1.29777	.21053	8.7840	9.6371

*Resource: Extracted from SPSS25***Table 1.3. Frequency analysis result****Safety culture at ambulance services in XYZ company Qatar**

Criteria	Value	Frequency	Percent	Valid percent	Cumulative percent
Management Commitment	No	11	28.9	28.9	28.9
	Yes	27	71.1	71.1	100.0
Communication	No	15	39.5	39.5	39.5
	Yes	23	60.5	60.5	100.0
Employee Involvement	No	18	47.4	47.4	47.4
	Yes	20	52.6	52.6	100.0
Training & Information	No	11	28.9	28.9	28.9
	Yes	27	71.1	71.1	100.0
Motivation	No	16	42.1	42.1	42.1
	Yes	22	57.9	57.9	100.0
Comply with Policy & Procedure	No	10	26.3	26.3	26.3
	Yes	28	73.7	73.7	100.0
Learning Organization	No	14	36.8	36.8	36.8
	Yes	24	63.2	63.2	100.0

Resource: Extracted from SPSS25

Anyhow, the essential strategy based on the expert's judgment was operational approach strategy with a value of 0.386 (38.6%). The following strategy was the human approach. In this approach strategy, the expert binds the second priority with a value of 0.327 (32.7%). While the latter approach is a management system approach with a value of 0.286 (28.6%). Overall this assessment has a level of inconsistency or CR 0.03 so that the judgement and opinions of experts was logic and can be accepted See, Figure 1.5.

Based on the expert's judgment, who was prioritizing operational strategies was the most important with a value of 0.386 (38.6%) is very appropriate. It is because of the XYZ Company already has an excellent safety management

system, but the implementation in the field still needs to be improved. In this case, it was evident from the KPI index that does not meet the target and safety culture results. The determination of safety values is not limited to paper, but it needs explicit work. For this reason, a strategy for improving safety culture with operational approaches can be carried out in the following ways [27]:

- How to work safely.
- Management changes
- Safe operation
- Process safety management

The second strategy should be developed is a human approach strategy with a priority value of 0.327 (32.7%). The approach to

insane, or better known as behavior-based safety (BBS), is a fundamental alternative strategy. This strategy requires hard work to run it. Behavior change cannot be done in a short time but requires clear steps and programs with the support of top management. They argue that; *"Safety culture will run effectively and successfully if there is motivation and have positive attitudes and behaviors, so they will tend to do positive things too."* Thus, all existing regulations and systems will be easy to run.

The last strategy is the approach strategy of the system with a value of 0.286 (28.6%). In this approach focuses on building an OH&S management system within the organization to improve the program and safety culture. Reasonable policies and procedures support the success of safety in the operation of ambulances or other activities — this approach made by creating a system of documentation, control of documents, and data. At the same time, building work plans in ambulances, targets, and excellent communication between personnel. The Expert's mentioned: *"A safe way of working by analyzing the surrounding risks and following the procedures in the ambulance service, will provide a sense of security in working."*

Studied by Jones in Wankhade & Jones, [4] states, "Quality management systems that are simple, are continuous, and allow for

rapid changes in the system need to be implemented". To maintain and improve service, systematic documentation, routine training, and continuous audits need to be promoted.

It is also supported by Pirrallo, et al. [28] "The development of policies and protocols related to operational safety directly impacts the safety of the patient". Those all the steps will improve the system and quality management in the operation of the ambulance.

According to Wankhade & Jones, [4] in ethnographic studies in the UK about cultural elements in ambulances, identifying three different occupational subcultures using the Schein [29] typology: Elements of safety and health culture can be organized into three categories: a). Organization. This includes policies, procedures, and systems related to safety, and health. b). Psychological, which involves individual perceptions, attitudes and values. c). Behavior, people's behavior, health, and safety behavior.

Meanwhile, in the context of ambulance operations, commitment from executives or top management is very significant because it is related to the vision and mission, values, financing, and system building. If you do not have a clear commitment, the results will not be achieved. So, with this, expert judgment can be summed up simply in an AHP hierarchy like Figure 1.6 and in-house model like Figure 1.7.

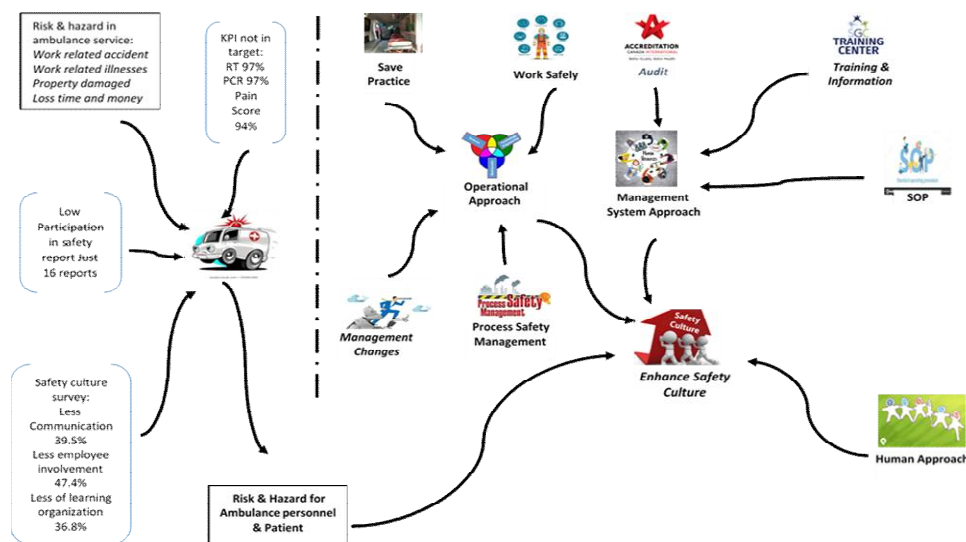


Figure 1.3. Rich picture of situation problem at ambulance service in XYZ Company

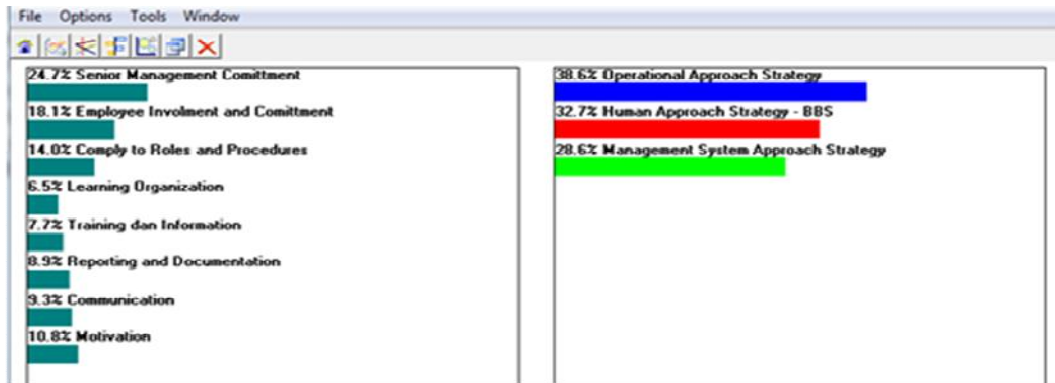


Figure 1.4: Strategy and factors to enhance safety culture at ambulance services at XYZ Company in Qatar. Source: Extracted from Expert Choice 2000



Figure 1.5: Priority of Safety Culture Improvement strategies in ambulance services at Qatar XYZ Company. Source: Extract from Expert Choice 2000

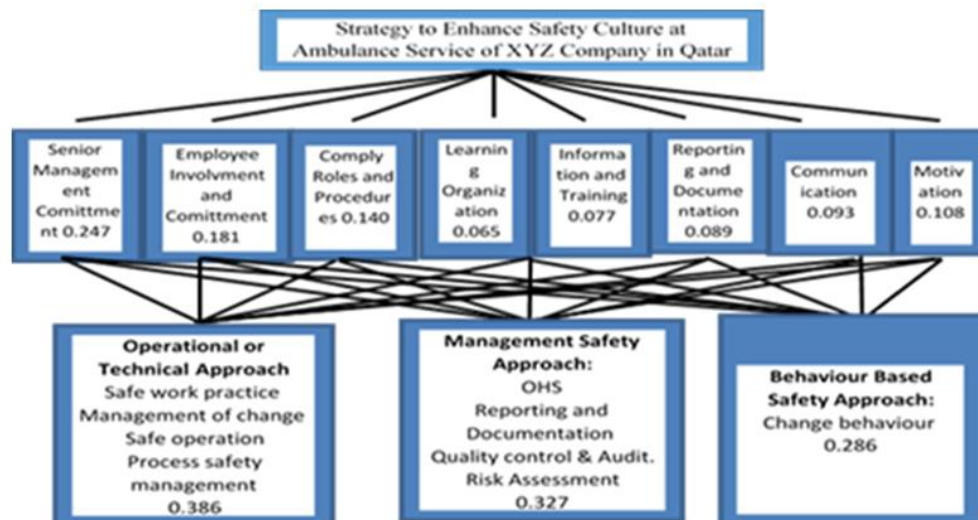


Figure 1.6: AHP Hierarchy Results of Strategy to Enhance Safety Culture at Ambulance Service of XYZ Company in Qatar.

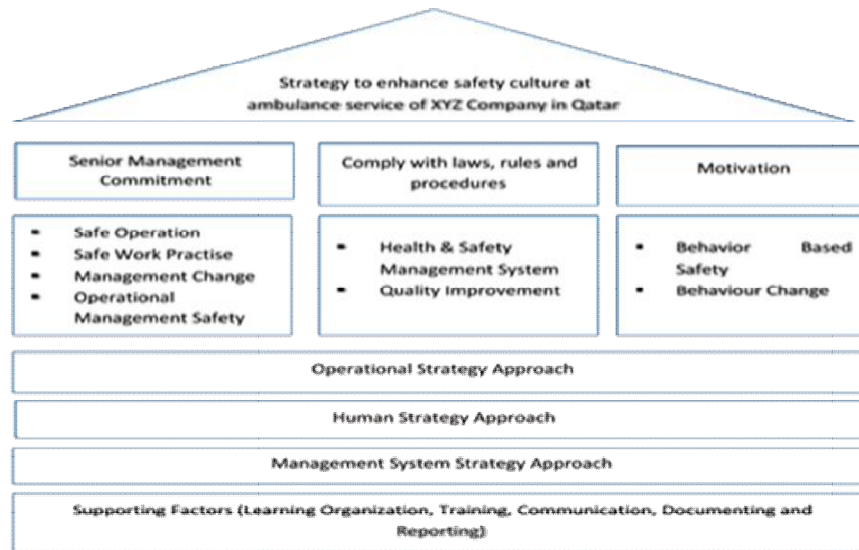


Figure 1.7: The House Model of Strategy to Enhance Safety Culture at Ambulance Service of XYZ Company in Qatar

5. CONCLUSION

Provide a high quality of ambulance services with the medical organization, and the safety aspect is one most crucial component while delivering care. Enhancing safety culture within an organization is one program to improve safety performance. According to the discussion and expert's judgement with AHP method regarding of strategies to improve safety culture in ambulance services at XYZ Qatar, the researcher can answer the research formulation as follows: (1).To enhance the safety culture of ambulance services in XYZ companies, the operational approach strategy is the most important strategy to implement and develop. (2). In terms of implementing this strategy, the commitment factor of senior management is the most important thing in an effort to improve safety culture in ambulance services in Qatar XYZ Company. (3). The House Model method is a model or presentation of a strategy to improve safety culture in the ambulance service with a mission on the safety of ambulance personnel and patient. The three main factors become pillars in building a strategy to improve safety culture in ambulance services, namely commitment from management and employees, compliance with regulations and motivation. These pillars upheld through operational approach safety programs through safe work, changes to management by making regulations and work standards, synergized with approaches to employees by changing behavior and perceptions and providing motivation with the

support of a sound system approach about safety through a safety management system that continues to develop with the ongoing audit.

6. RECOMMENDATION

The development of safety culture in ambulance services will improve the quality of services that prioritizes the safety of personnel and patients. Safety concerns from all level management and effective approach will be improve quality service. Further research needs to be done in an effort to develop a safety culture in ambulance services and the development of safety programs that are directly related to the safety of ambulance personnel and patients in particular.

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COMPETING INTERESTS

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for

the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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