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Management of whiplash-associated disorder in the Italian emergency department: the feasibility of an evidence-based continuous professional development course provided by physiotherapists

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ABSTRACT

Purpose: The management of whiplash and associated disorders (WAD) in the Italian Health System is still empirical and influenced by a single professional's expertise. Therefore, the purpose of our study is to describe a structured management changes in an Italian emergency department (ED) after an evidence based continuous professional development (CPD) course.

Methods: A CPD course was organized by Orthopedic Manipulative Physical Therapists (OMPT) for personnel of ED in the hospital Girolamo Fracastoro (San Bonifacio, Verona, Italy), based on latest scientific evidence. Data regarding the number of X-Rays, computed tomography (CT) scan, orthopaedic referrals, neck collars and WAD IV (i.e., severe diagnosis) before and after the course were compared.

Results: 3066 cases of WAD have been analyzed in 2016 and 2185 in 2017/2018. The number of X-Rays dropped down from 15.1% to 13.5%; the CT scans increased from 1.3% to 1.9%; the WAD IV diagnosis increased from 0.7% to 1.6%; the orthopaedic referrals dropped from 1.5% to 1.1%; the collars prescription dropped from 8.8% to 2.5%.

Conclusion: An updated framework increased the efficiency of ED's maintaining the same level of safety (i.e., WAD IV diagnosis). Given that, it can also be argued that, in line with other countries, the implementation of an OMPT role within the ED multidisciplinary team is advised also in Italy.

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► IMPLICATIONS FOR REHABILITATION

- Physiotherapists were commissioned to organize a management change of patients in an Italian Emergency Department clinical setting for the management of whiplash;
- Guidelines and other appropriate clinical rules facilitate the delivery of an evidence-based and more appropriate management and care plan;
- An inter-disciplinary continuous professional development course has the potential to positively influence patients' journey and to optimize the use of departmental resources;
- The involvement of other health professionals (e.g., Physiotherapists) within the Italian Emergency Department organizational chart might lead to further improvement of service provided.

Introduction

“Whiplash-associated disorder” (WAD) is an umbrella term used to label a variety of symptoms often reported by patients following an acceleration/deceleration injury to the neck that most commonly occurs as a result of a road traffic collision [1]. More than 85% of these patients experience posterior neck and shoulder pain [2]. Other common symptoms of WADs are cervical spine stiffness, headache, dizziness, numbness, sleeping difficulties, fatigue and cognitive deficits [3]. WAD is often associated with disability, psychological distress and decreased quality of life [1]. These latest non-physical components significantly contribute to either a delayed or incomplete recovery following a whiplash injury. They also lead to doubling the healthcare utilization, its

related costs and to considerably longer sick-leave compared to those people presenting with only physical impairments [1,4,5].

Over the past three decades the number of patients attending the Emergency Department (ED) with WAD after road traffic collision has been increasing [6]. The most recent data suggest that more than 300 persons per 100.000 are assessed and treated in EDs every year in Europe and North America [7]. Moreover, in Australia, WAD's comprise 75% of all survivable road traffic collisions [8]. From an Italian epidemiological perspective, these injuries to the cervical spine represent 45.3% of all traumas associated to car accidents [9].

The worldwide financial burden of whiplash injuries is huge. That is, in Australia (e.g., Queensland) the costs are substantial

and exceed \$350 million per years [10]. In the other Western countries these costs are even more relevant: in the United Kingdom whiplash personal injury claims exceed £3 billion per year [11], while in the United States the economic costs reach \$242 billion, including \$23.4 billion in medical cost and \$77.4 billion in lost productivity (both market and household) [12]. According to the European Committee of Insurance, the expenditure for these injuries in Italy represents about 33% of total cost for claimed personal damage [13].

Accurate diagnosis and management of WAD can be challenging for ED clinicians due to a wide variety of possible clinical presentations. The assessment of non-musculoskeletal red flags or serious pathologies, cervical spine fractures or dislocation, disc disruptions and radiculopathies are the mainstay of ED care and usually requires early imaging. However, in the absence of red flags, specific tissue damage or a peripheral lesion cannot be identified as the cause of patient's complaints in most of cases [14]. Given that, "minor trauma" of the neck is the final diagnosis for 85% of all WAD presenting to EDs [15]. Although the majority of these patients will have a positive prognosis, the importance of early appropriate management is of paramount importance. Inappropriate management within the ED can over-commit resources that could be otherwise be utilized in the treatment of more relevant and pertinent clinical presentations [16]. That is, the X-ray over-usage in the attempt to identify serious pathologies, the administration of pharmacological treatments and the cervical collars prescription have a high impact on the expenses of ED. In addition to this, an excess of human resource, both in term of time and personnel, could be utilized for the management of patients with WADs.

The ED professionals seem to recognize the inappropriate onward referrals to procedures and treatments, such as imaging and pharmacy, as one of the causes of overload of their departments. These criticalities are perceived as a barrier to reach targets, compromise the clinicians' ability to care and put pressure on the department personnel to make clinical decisions without sufficient time [17]. The clinical decision-making process in the ED following these injuries can also influence society productivity cost later on in time in nature of sick-leaves.

Recently, a high number of Evidence based Guidelines [18] have been published with the attempt of improving cost-effectiveness of WAD management and care. First of all, it is recommended to categorize all types of disorders of the cervical region, including WAD, following the Neck Pain Task Force (NPTF) classification [19] to have a better labeling classification, management profile [20] and standardized terminology. WAD can be classified into 4 grades, distinguished by the severity of symptoms, signs and impact on activities of daily life (Table 1).

Clinicians are advised to utilize Canadian Cervical Spine rules (CCR), or other appropriateness criteria, to rule out the need for imaging in acute care setting [21,22]. These rules show very high sensitivity and specificity to detect WAD IV [23,24], and have to be employed in order to reduce unnecessary radiation exposure as well as to drastically reduce costs, without compromising the

diagnostic accuracy of serious sequelae (e.g., cervical bony or ligamentous instability) [25].

Another critical aspect is to recognize and consider the prognostic factors (either positive or negative) in order to minimize the risk of residual impairments, with subsequent potential financial implications [25]. Providing advice to stay active and give reassurance is the first-line treatment recommended in most of these guidelines [18,21,26,27]. On the other hand, rest and immobilization (including soft collar) are strongly not recommended because of their contribution in developing and reinforcing negative psychological and behavioral attitudes (e.g., kinesiophobia, passive coping, fear-avoidance attitudes, etc.) [18,21,25,27].

In Italy, health professionals who deal with the diagnosis and management of WAD in an ED are nurses during the triage process, the Medical Doctor (MD) engaged for the diagnosis and treatment prescription and subsequently, outside the ED setting, physiotherapists depending on the type and severity of diagnosed WAD. On the basis of our direct experience to the Italian Health System we have noticed that the management of WAD is still empirical and too often influenced by single professional's expertise clinicians often do not offer adequate patient education (e.g., advice to rest). Moreover, unnecessary orthopaedic further assessment and soft collars after discharge are commonly prescribed. This potentially leads to an overloaded system, inappropriate exposure of patients to radiation, increased risk of delayed recovery and significant health, social and insurance costs. Therefore, the aim of our study was to evaluate the impact of a continuous professional development (CPD) course on the management of patients with WAD in an Italian ED setting. The objectives of the course were to adopt a more uniform approach within the ED, based on the best available evidences on: the appropriate use of radiological imaging, the ability of detecting highest severity of the pathology, the correct onward referral to specialty for further assessment and the use of evidence-based management after the discharge (e.g., Schanz collar prescription). Furthermore, the potential advantages of the presence of the Orthopaedic Manipulative Physical Therapist (OMPT) professionals in ED is also discussed. The International Federation of Orthopaedic Manipulative Physical Therapists—a subgroup of the World Confederation for Physical Therapy—defined the Orthopaedic Manipulative Physical Therapy as a specialized area of physical therapy for the management of neuro-musculoskeletal conditions, based on clinical reasoning, using highly specific treatment approaches including manual therapy and therapeutic exercises. Orthopaedic Manipulative Physical Therapy also encompass, and is driven by, the available scientific and clinical evidence and the biopsychosocial framework of each individual person.

Materials and methods

The project was born as the result of a professional confrontation between ED physicians and Orthopedic Manipulative Physiotherapists (OMPT) on the management of patients with WAD in San Bonifacio ED (Ospedale Girolamo Fracastoro, via Circonvallazione, 1, 37047 San Bonifacio VR). That is, the clinical management of these patients was

Table 1. Classification of neck pain-associated disorders (NAD) and whiplash-associated disorders (WAD).

The 2000–2010 bone and joint decade task force on neck pain and its associated disorders classification of NAD

Grade	Definition
I	No signs or symptoms suggestive of major structural pathology and no or minor interference with activities of daily living
II	No signs or symptoms of major structural pathology, but major interference with activities of daily living
III	No signs or symptoms of major structural pathology, but presence of neurologic signs such as decreased deep tendon reflexes, weakness or sensory deficits
IV	Signs or symptoms of major structural pathology

Table 2. Pre and post- course comparison of the WAD management strategies in the ED.

	PRE-COURSE USUAL CARE	UPDATED POST-COURSE CARE PATHWAY
Screening and Evaluation	Screening and evaluation based on Orthopaedic physician's discretion Non standardized patient's classification Imaging use based on Orthopaedic physician evaluation	Care pathway framework adoption, including human resources rules 4 grades neck-pain task force WAD classification The use of Canadian Cervical Spine rules for the vertebral fracture/dislocation ruling out process; Imaging prescriptions based on the use of Canadian Cervical Spine rules and imaging diagnostic accuracy and cost-effectiveness (CT scan VS X-ray)
	WAD IV evaluation based on the clinician's expertise	The use of Canadian Cervical Spine rules for the vertebral fracture/dislocation ruling out process; Imaging prescriptions based on the use of Canadian Cervical Spine rules and their diagnostic accuracy (CT scan VS X-ray). Update on risk factors and clinical signs and symptoms for the screening of other medical conditions (e.g., cervical vascular pathologies)
	WAD III evaluation based on the clinician's expertise	Update on risk factors, clinical signs and symptoms, clinical evaluation, and testing for the screening of other medical conditions (e.g., peripheral neuropathic pain)
Management	Management based on Orthopaedic physician's discretion Cervical immobilization with soft/rigid collar based on clinician's judgment	Care pathway framework adoption, including human resources rules Avoidance of the use of the soft collar stimulating patient active mobilization; the collar's use is allowed intermittently in case gives symptoms reduction or because the patient's preferences/beliefs (including payment policies)
	Routine Orthopedic physician referral for management prescription	Orthopaedic physician referral based on symptoms severity based on the 4 grades classification (WAD IV-III); encourage direct physical therapy referral for a multi-modal care management for WAD with positive prognosis (WAD I-II)
	Resting and passive modalities/therapies (e.g., only medications) recommendation Protect the neck from potential further damages and movement avoidance to avoid symptoms worsening	Encourage active lifestyle, active coping in order to reduce the negative prognostic factors and avoid symptoms' persistence Provide education about pain neurophysiology and benefit of stay active, combined with early OMPT physical therapy referral for a multimodal-care management (i.e., supervised exercise, self-efficacy strategies, education, manual therapy)

The course was based on the best available evidences and consisted of both theoretical and practical aspects covering the following main contents.

heterogeneous and based only on professionals' personal choice, knowledge and background. The lack of a standard management pathway, in parallel with the need of allocation of resources, suggests the need to design a more standardized updated framework. Two OMPTs with experience in education (FM and AP) were commissioned by direct call to structure a course based on clinical practice guidelines and the best available evidence and the main needs of the ED. Then, a multi-disciplinary team composed by OMPTs, ED physicians and ED nurses, reviewed the course's content in order to increase the generalizability for the specific setting. The 2 physiotherapists delivered the in-house CPD course focused on WAD assessment and management in February and March 2017. The course consisted of both theoretical and practical aspects covering the relevant topics for the setting such as epidemiology, economics cost and EBM management of WAD I-IV: the main content with a comparison of the pre and post-course strategies are summarized in [Table 2](#). An updated care pathway framework with ED's human resources positions was also presented ([Figure 1](#)). It took a total of 4 h to be completed and it was held 3 times to allow all ED's staff to participate (14 ED physicians and 26 ED nurses).

The physical therapists also developed a Patient Information Leaflet that ED's physicians handed out to WAD patients during the consultations. The Patient Information Leaflet was designed on the updated recommendations ([Table 2](#)) to be used as an educational tool during the visits in ED and provided understandable information about the nature and recovery of WAD, the use of imaging, the use of the collar, the implications of staying active, on what it is and why is important an early OMPT physical therapy management, and advices to encourage the patient's self-efficacy by staying active and few simple exercises ([Figure 2](#)).

After that, we conducted a retrospective analysis of WAD patients admitted to the ED in two different timeframes: from 1 January 2016 to 31 December 2016 (year 2016) and after the completion of the CPD course (from 1 April 2017 to 31 March 2018 -year 2017/2018).

Patients were included in the study if their diagnosis at the ED access was recorded as one of the following keywords: "Neck Pain," "Whiplash," "Cervical Strain," "Neck Strain," "Neck Strain Sprain," "Cervical Strain," "Neck Sprain." The team gathered data regarding the number of X-rays and computed tomography (CT) scan requested, the number of cervical fracture (WAD IV) diagnosed, the number of referrals to Orthopaedic consultations and the number of Schanz collars provided as part of the treatment. The collection of data was done in an anonymous manner. Data were presented as absolute and relative percentages. The statistical analyses were conducted to compare the data belonging to year 2016 with respect to year 2017-2018 by using chi-squared tests (Sigmaplot 11.0; Systat Software Inc.).

Results

In 2016, ED's hospital registered 55.134 admissions, of which 3.066 (5.6%) had a WAD. Four hundred and sixty-two (15.1%) X-Rays and thirty-nine (1.3%) CT scans was prescribed, for a total of 16.4% patients who received imaging. Twenty-two patients (0.7%) had a cervical fracture (WAD IV), forty-five (1.5%) underwent an orthopaedic specialty assessments and Schanz collar was prescribed to two hundred and seventy-one (8.8%) patients on discharge.

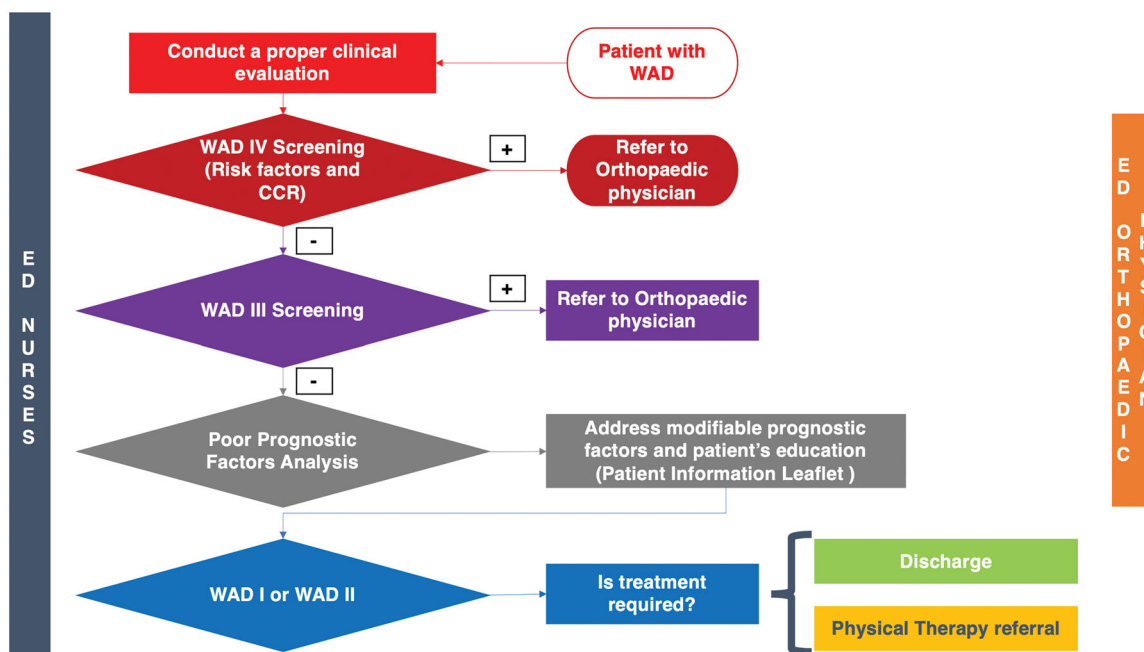


Figure 1. The updated care pathway framework with ED's human resources positions.

In the period analyzed after the CPD course (year 2017/2018), a total of 54,785 patients presented to ED, including 2,185 (3.9%) with WAD. The 15.4% of patients received imaging, consisting of 297 (13.5%) X-rays and 41 (1.9%) CT scans. Thirty-four (1.6%) patients had a cervical fracture (WAD IV), twenty-four (1.1%) have undergone an orthopaedic specialty assessments and fifty-five (2.5%) received Schanz collar prescription on discharge.

The summary of the results is showed in Table 3.

The increase in WAD IV diagnoses and the reduction of collar prescription in 2017-2018 compared to 2016 were statistically significant ($p < 0.05$ and $p < 0.01$, respectively). No significant differences were found for the other variables (number of X-ray exams, number of CT scans, number of orthopaedic referrals).

Discussion

This study highlights the impact of a CPD course based on the best available evidence for the management of patients with WAD in ED. We observed that the total number of WAD diagnoses in 2017/2018 compared to 2016 decreased significantly from 5.6% to 3.9% ($p = 0.001$). It can be assumed that using a standardized classification and definition (Table 1) [19] may helped in appropriately and homogeneously labelling patients between the ED's staff.

The CCR has been shown to be a valid and reliable clinical tool improving the health care resources efficiency [28]. That is, Coffey et al. [23] reported a cervical spine radiographs reduction of 17.4% using the CCR without compromising patient safety. Additionally, it has been shown that reducing the number of X-rays leads to a reduction of costs, waiting times and unnecessary radiation exposure for patients [25,29,30]. Although statistically not significant, our data showed that the adoption of CCR led to a more appropriate imaging requests with a reduction of X-rays performed in the last year analyzed compared to 2016. Furthermore, we observed a tendency to increase CT scans use in the period 2017/2018. In the authors opinion what we observed reflect an early change in usual practice of ED's staff due to the

use of the CCR in their clinical decision-making process regarding imaging and may indicate a deeper understanding about the accuracy values of imaging procedures in appropriately diagnose cervical fractures. That is, the application of CCR in emergency setting has been previously shown to increase the appropriateness in CT scan prescription [31]. Holmes and Akkinepalli [32] found that the pooled sensitivity for identifying patients with cervical spine injury was 52% for plain radiography versus 98% for CT. This findings are in line with Ngatchou et al. [33] who reported good quality cervical X-rays in only 37.7% of ED's patients following a cervical blunt trauma. Interestingly, Gale et al. [34] concluded that plain cervical spine radiographs are inadequate to fully evaluate the cervical spine after blunt trauma, and supplemental CT is commonly required. Several others studies have suggested the superiority of CT in moderate to high-risk adults [32,35] as well as in lower risk context [36,37]. On the other hand, the systematic use of CT for the initial evaluation of blunt cervical spine injury raises the problem of radiation exposure [38,39] and higher costs [40]. Despite that, two studies showed that CT scan is more cost-effective, especially in moderate-risk to high-risk of cervical fractures [35,41].

Although the total number of WAD diagnosis significantly decreased, the cervical fracture detection increased significantly from 0.7% to 1.6% ($p = 0.006$). We assume that the CPD course guaranteed a more appropriate approach to detect cervical spinal fracture or dislocation by the CCR adoption as screening tool that may helped in better selecting which patients were in need of a more appropriate CT scan instead of a less accurate X-ray imaging. Indeed, the CCR have consistently high sensitivity, indicating that a negative test result is highly informative in excluding a clinically important cervical spine injury [42]. Our results could also indicate a lower rate of possible misdiagnosis of serious pathologies. It has not been possible to analyze re-attendances to ED so a comparison about the reliability of the screening process for WAD IV among the years analyzed has not been possible. Nonetheless, a large-scale study reported no missed fracture or adverse outcome when CCR are applied [43].



Figure 2. Patient Information Leaflet that ED's physicians handed out to WAD patients during the consultations.

Table 3. ED data and clinical features of WAD patients.

	2016		2017/2018		Chi Squared	p
	n	%	n	%		
ED Total access	55,134	—	54,785	—	—	—
WAD Diagnosis	3066	5.6	2185	3.9	135.5	0.001*
X-rays	462	15.1	297	13.5	1.58	0.208
CT Scan	39	1.3	41	1.9	2.63	0.105
WAD IV	22	0.7	34	1.6	7.54	0.006*
Orthopaedic referral	45	1.5	24	1.1	1.04	0.307
Schanz collar	271	8.8	55	2.5	77.1	0.001*

ED: emergency department; WAD: Whiplash-associated disorders; CT: computed tomography. The percentage refers to WAD patient's population.

*Statistically significant differences between groups ($p < 0.05$).

After the CPD course, the observed small decrease of orthopaedic referrals led to a reduction of waiting times and ED's costs (data not reported) in terms of ED personal workload. Notably, this small change could be explained by the fact that in the Italian health care system, patients seeking care in ED need a physician prescription for their management.

The Schanz collar prescriptions significantly dropped from 8.8% to 2.5% ($p = 0.001$). All guidelines agree that collars are contraindicated for WAD I-II-III [18,26,27]. Collar prescription is in sharp contrast to the recommendations of staying physically active, acting as usual and promoting mobility [18,27]. An active

approach guarantees a reduction of pain intensity and disability compared to cervical immobilization [44,45]. Cervical collar may impede natural recovery by promoting prolonged neck stiffness through inhibiting movement and discouraging patients from taking an active role in their own recovery [46]. Based on our data, it is not possible to know how many cervical collars were prescribed to patients depending on their severity of WAD.

Furthermore, it is important to remember that clinical guidelines recommend addressing negative prognostic factor as first line management strategy by education in addition to physiotherapy [18,20,21,25–27]. Generally, WAD is culturally considered pessimistically leading to negative beliefs and behaviors which might cause a recovery delay [47]. Patient information leaflets appear to be highly suited to this context, reinforcing the patient education delivered by ED's physician during the consultation [48]. They play a role in the continuity of care by facilitating hospital to physical therapy referral or home transition, and can be considered as a resource both for patients and doctors, improving patients' knowledge, adherence to treatments and help following the advices provided [49]. Patient Information Leaflets also improve the doctor-patient communication, patient satisfaction and reduce re-attendance to ED for the same pathology after discharge [50].

Our results highlighted several improvements in the management of WADs after the CPD course and this was only possible

thanks to the collaboration between ED's physician, nurse and OMPT. In an effort to ensure the proper MD referral and to reduce the workload, nurse practitioners and advanced practitioner physiotherapists have gained in the last decade more skills and competences in the first contact, screening and treatment of musculoskeletal injuries in the ED [51–53]. It is common knowledge that physical therapists have been successfully employed as independent care providers in the emergency/acute care setting for more than 40 years in both Australia and the United Kingdom [54]. In the United Kingdom, Ireland, Canada and Australia, “advanced practice,” “extended scope,” or “primary contact practitioner” physical therapists work as autonomous practitioners, assessing and treating patients independently from physicians and alongside them [55]. An extended scope physiotherapist, nowadays also called Advanced Practitioner Physiotherapist, can potentially manage up to 30% of the total ED's caseload, reducing significantly the overall ED waiting times [56]. Oakley and Shacklady [57] reported that extended scope physiotherapist have high degree of diagnostic ability in the triage of musculoskeletal disorders, and this is recognized by both patients and doctors. Extended scope physiotherapists obtain equivalent clinical outcomes compared to doctors of all grades, providing a high-quality standard of care at an affordable cost [53,58] and achieving a high level of patient's and ED's staff satisfaction [56,59]. Based on the results achieved and described in other western countries with a similar health system and considering that 13% of all attendances in Italian EDs are related to musculoskeletal disorders [55], the presence of an extended scope physiotherapist role within the Italian ED multi-disciplinary team would be advantageous. This could lead to better use of resources, reduction of costs and less departmental overload. In Italy, mainly due to legislative limitations, this does not represent the current reality of the local health system organization.

Limitations

This study was conducted in a single ED center, and in a rural area. In urban and/or bigger centers, perhaps patient and clinician behavior would be different. In addition, a cost-beneficial analysis was not allowed reducing the capability to objectively estimate the potential benefits of the new management strategy in an economical viewpoint.

Conclusion

Our study informs on how an evidence based structured management for WAD lead to an optimization of the patients' handling and of the human resources position in the ED. We demonstrated that changes can be made by adopting the recommendation of the most recent literature, improving the efficiency of ED without affecting the patients' safety. The most recent guidelines highlighted that providing an early evidence-based care and advice are crucial in the management of WAD patients and the prevention of development of persistent symptoms: the ED can have a significant role for the prognosis of these patients. The introduction of extended scope physiotherapist in ED's multi-disciplinary team might lead to further improvement in ED's service. Further studies to determine whether our findings are replicable in other regions of Italy, urban cities and/or different ED settings are needed.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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