

**Pain management in children has significantly improved in the Italian  
emergency departments**

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**Short title:** Changes in paediatric pain management

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## **ABSTRACT**

### **Aim:**

Pain in children is often poorly assessed and treated in Italian emergency departments (EDs) as found in a survey conducted among the centres of the “Pain in Pediatric Emergency Room (PIPER)” Study Group in 2010. Our aim was to evaluate the changes in pain management in Italian EDs in the last years.

### **Method:**

A structured questionnaire about pain assessment, protocols, use of local anaesthetics before venipuncture, opioids, and adjuvants was mailed to 46 Italian emergency departments between November 2017 and April 2018.

### **Results:**

Pain was always assessed at triage in 34 centres (73.9%). Algometric scales were used in over 90% of emergency departments. Triage protocols were available in 37 centres (80.4%). Local anaesthetics before venipuncture was always used in 6 centres (13.0%). Protocols included opioids and adjuvants in 73.0% and 47.2%, respectively. Triage pain assessment was always done in 91.0% of the centres joining the PIPER Study Group up to 2015 and 56.5% in ones that joined the Group after 2015 ( $p=0.017$ ). Local anaesthetics before venipuncture was given in 39.1% of the centres joining until up to 2015 and 13.0% in ones that joined the Group after 2015 ( $p=0.003$ ).

### **Conclusion:**

Paediatric pain management has significantly improved in Italian EDs in the last 8 years. The centres joining the PIPER Study Group for longer time have shown better results for the indicators considered in the survey.

**Key words:** Algometric scales; pain; protocols; training; triage.

**Key notes:**

- Several initiatives have been conducted to improve pain management in Italian emergency department (EDs), but their effectiveness is unknown
- Paediatric pain management has significantly improved after a comprehensive strategy in Italian EDs.
- Most centres have written protocols and regularly assess pain with validated scales, but routine use of local anaesthetic before venipuncture is still lacking.

## **BACKGROUND**

The management of pain in children is a crucial task for the emergency care team. Specific guidelines and validated tools for pain assessment at any age and clinical situation have been developed, as well as pharmacological strategies for effective pain prevention and treatment (1-3). However, despite all the available instruments, paediatric pain is often poorly assessed and treated in emergency departments (3,4). Since 2009, the Pain in Pediatric Emergency Room (PIPER) Study Group has involved healthcare providers of Italian emergency departments with the aim of sharing and promoting the appropriate management of paediatric pain (5). The first PIPER initiative was a national survey about paediatric pain management in emergency departments, involving 19 centres in 2010 (6). The results of that survey pointed out that pain management was often inadequate: approximately half of the centres did not have written protocols or did not consider pain among triage features. In addition, pain was regularly assessed only in about 25% of centres, while about 33% of the centres did not use any algometric scale and only 10% used topic anaesthetics before venipuncture. Based on this study, PIPER decided to develop training activities for healthcare providers, to share validated tools for pain management, and to promote research on paediatric pain in the emergency department.

The aim of the present study was to assess the changes in paediatric pain management in Italian emergency departments eight years after the first survey.

## **PATIENTS AND METHODS**

All 46 PIPER centres were invited to participate. The survey was conducted through a structured questionnaire investigating the characteristics of the centres and pain management at triage and in the emergency room. The questionnaires were sent on 1

November 2017. Periodic reminders were sent to each centre and data collection ended on 30 April 2018.

To verify whether joining PIPER had an impact on pain management, we compared 23 centres adhering to PIPER until 2014 to 23 adhering since 2015. As regards triage management, we have investigated if dedicated protocols were available, if pain was measured, if algometric scales were used, and if analgesics were administered. Then we have asked if protocols for pain management were available in the emergency room and if they included opioids and adjuvants. Last, we have investigated the use of local anaesthetics before venipuncture.

Results were given as absolute and relative frequencies for categorical variables, and median and interquartile range for the continuous variables. The associations between qualitative variables were measured with the chi-square test and Fisher's exact test for proportions; Kruskal-Wallis test was used for differences in quantitative variables distributions.

Statistical analyses were performed with the SPSS Statistics package version 20.0.0 (IBM, Chicago, Illinois, USA). The statistical significance was set at  $p < 0.05$ .

As this study did not involve any collection of analysis or personal data regarding human participants, but only hospitals and policies, requirements for informed consent and approval by Ethics Committee were not applicable.

## **RESULTS**

All the invited centres accepted to participate and completed the survey; 26 of them had already participated to the previous survey (6). Table S1 shows the structural and organizational characteristics of the participating centres divided by geographical area. Out of the 46 emergency departments, 31 (67.4%) were in Northern Italy, seven (15.2%) in central regions and eight (17.4%) in Southern Italy. The total number of paediatric consultations was approximately 900,000/year and the median number of

visits per centre was 16,245 (range 9,811-24,016). Despite different concentration of emergency departments at the different geographical areas, there were no statistically significant differences in the number of children seen in emergency departments of North, Centre and South ( $p = 0.34$ ).

Table 1 shows pain management practices at triage and in the emergency room in the centres. Pain assessment was always performed in at triage and in the emergency room in 34 (73.9%) and 26 (56.5%) centres, respectively. In 24 (52.2%) centres pain was always assessed in both the settings, while in 10 (21.7%) centres it was assessed at triage, but never or only sometimes in the emergency room. Algometric scales were used in over 90% of hospitals. The most common scales used were the Face Legs Activity Cry Consolability (FLACC) Scale, also in the revised version (FLACC-R), the Wong-Baker Scale and the Numerical Rating Scale (NRS). Triage pain measurement was recorded electronically in 33 (71.7%) centres and the recording was mandatory for 19 of them (57.6%).

Protocols for pain assessment were available in 37 (80.4%) centres at triage and in 36 (81.8%) in the emergency room. As regards triage protocols, pharmacological treatment was included in 68% of them, non-pharmacological treatment in 58%, algometric scales in 81%, and indirect measurement of pain in 41%. Only seven (15.2%) triage protocols included all the four above mentioned aspects.

As regards non-pharmacological treatment, non-nutritive sucking for infants and soap bubbles have been reported by 22 (47.8%) centres, videogames by 18 (39.1%), fairy tales reading by 16 (34.8%), music and breathing techniques by 10 (21.7%), and desensitisation techniques by eight (17.4%). Only one protocol considered pet-therapy. In one department, parents were asked not to enter the emergency room with their

children, while in 11 (23.9%) cases, they were not allowed to hold their child during venipuncture.

As regards pharmacological therapy, local anaesthetics before venipuncture were reported only by six (13.0%) protocols; opioids and adjuvants were reported respectively by 79.4% and 51.5% of protocols. The reassessment of pain after analgesics was reported by 12 (27.9%) centres.

The comparison between practices in the 23 centres joining PIPER until 2014 and the 23 included since 2015 is reported in Table 2.

## **DISCUSSION**

Our study showed that paediatric pain management in Italian emergency departments, even if not yet optimal, has markedly improved in the last years. At the time of the survey, most centres had written protocols, and regularly assessed pain at triage by validated scales. However, some issues were still poorly considered, such as the use local anaesthetics before venipuncture or pain reassessment during the observation.

Several aspects determine the proper management of pain: the awareness of its importance, prompt assessment, appropriate management, and finally the re-evaluation of its course (7,8). It is well known that healthcare providers have many limits when they are confronted with pain, especially in children (9,10): lack of time, poor relevance given to pain, and reluctance to provide analgesics due to the fear of delaying the diagnosis (11). Moreover, the concerns about potential adverse effects or risks for addiction might negatively influence pain management in children (9,10).

The significant improvement of paediatric pain management reported in Italian emergency departments could be produced by multiple factors. First, the attention to pain in children has increased worldwide. Literature and conferences on this issue have

been increased in the last years (12,13). However, higher attention does not necessarily imply a change: excessive antibiotic prescription persists almost worldwide although antibiotic resistance is increasingly recognized (14). On the other hand, the training programs and social educational initiatives produced and supported by PIPER have likely promoted a more appropriate pain management (15). However, if isolated, such interventions tend to have a short-term effectiveness (16-18). Yet, beyond training programs and enhancement of social interest on pain, PIPER has also attempted to directly involve all the centres in research studies in order to enhance awareness and support long-term improvement of paediatric pain management in the emergency departments (5,19,20). Finally, the project attempted to concurrently involve both nurses and physicians. We speculate that this comprehensive strategy has been particularly effective to improve pain management. Moreover, the longer the centres joined PIPER, the stronger was the positive change for all the indicators that we considered in the survey.

Further attempts are needed for further enhancement of some issues, in particular the use of local anaesthetics before venipuncture and pain reassessment. Due to huge differences among PIPER centres and the lack of time in the emergency setting, tailored strategies for each emergency department could be the most effective (21). They should include short, but frequent educational recalls, active involvement of nurses as trainers both at triage and in the emergency room, and educational skills of any healthcare professional involved in children's care in the hospital, most of all in the adult setting. This study had some limits. First, protocols availability does not imply their accurate application. Second, we have not verified if the answers corresponded to the real situation of the emergency department that participated the survey. Third, we could not investigate all the factors potentially leading to the improvement of paediatric pain management. On the other hand, our study has also some important strengths. The



percentage of responders was optimal, and the number of centres involved was high. Indeed, the centres were distributed in all parts of Italy, took care of a high number of children and were both academic and non-academic, providing a reliable picture of the whole Italian paediatric emergency departments.

## **CONCLUSION**

In conclusion, paediatric pain management in Italian emergency departments, though not yet optimal, has markedly improved in the last years. The involvement in a structured study group with comprehensive strategies has been probably a key point. Similar initiatives could be applied and evaluated also in other paediatric fields that still need to be improved.

## **LIST OF ABBREVIATIONS**

EDs: Emergency Departments

FLACC: Activity Cry Consolability Scale

FLACC-R: Activity Cry Consolability Scale-Revised

NRS: Numerical Rating Scale

PIPER: Pain in Pediatric Emergency Department

## **CONFLICTS OF INTEREST AND FUNDING**

The authors have no conflicts of interests to declare.

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**Table S1. Characteristics of participating hospitals by geographical area.**

	North n (%)	Centre n (%)	South n (%)	Total n (%)
Type of hospital:				
General	19 (61.3)	4 (57.1)	5 (62.5)	28 (60.9)
Paediatric/maternal and child	12 (38.7)	3 (42.9)	3 (37.5)	18 (39.1)
Academic hospital:				
No	15 (48.4)	1 (14.3)	5 (62.5)	21 (45.7)
Mixed (hospital and university departments)	11 (35.5)	2 (28.6)	3 (37.5)	16 (34.8)
Yes	5 (16.1)	4 (57.1)	-	9 (19.6)
Type of paediatric emergency department:				
Pediatric (in paediatric hospital)	12 (38.7)	5 (71.4)	3 (37.5)	20 (43.5)
Formalized (paediatric ED in general hospital recognized by resolution)	13 (41.9)	2 (28.6)	3 (37.5)	18 (39.1)
Not formalized (paediatrician consultant to the general ED)	6(19.4)	-	2 (25.0)	8 (17.4)
Short Stay Observation (SSO):				
Not available	2 (6.9)	1 (14.3)	4 (50.0)	7 (15.9)
Available	27 (93.1)	6 (85.7)	4 (50.0)	37 (84.1)
Triage carried out:				
<24 h/day	-	-	-	-
24 h h/day	31 (100.0)	7 (100.0)	8 (100.0)	46 (100.0)
Triage method:				
First look only	2 (6.5)	2 (28.6)	3 (37.5)	7 (15.2)
Full assessment	28 (90.3)	4 (57.1)	4 (50.0)	36 (78.3)
Other	1 (3.2)	1 (14.3)	1 (12.5)	3 (6.5)

Triage protocols for code attribution:				
Specific protocols for paediatric age	23 (79.3)	6 (85.7)	6 (75.0)	35 (79.5)
Adult protocols modified / integrated for the paediatric age	6 (20.7)	-	2 (25.0)	8 (18.2)
Adult triage protocols	-	1 (14.3)	-	1 (2.3)
Number of annual paediatric admissions (x 1,000):	16.2	21.9	11.0	16.2
Median [IQR]	[9.8-23.1]	[14.0-44.0]	[8.0-50.0]	[9.81-24.0]

**Table 1. Reported practices about paediatric pain management.**

	At triage n (%)	In emergency room n (%)
Pain assessment:		
Never	2 (4.3)	3 (6.5)
Sometimes	10 (21.7)	17 (37.0)
Always	34 (73.9)	26 (56.5)
Use of algometric scales:		
No/Yes	4 (9.5) / 38 (90.5)	3 (7.3) /38 (92.7)
Results of pain assessment are recorded:		
No/Yes	6 (13) /37 (87)	7 (17.1) /34 (82.9)
Availability of protocols for pain assessment:		
No/Yes	9 (19.6) /37 (80.4)	8 (18.2) /36 (81.8)
Availability of protocols for pain treatment:		
For physicians	-	25 (62.5)
For nurses	16 (41.0)	-
In common	25 (62.5)	25 (62.5)
Pain level contributes to priority determination at triage:		
No/Yes	15 (32.0) /31 (67.4)	
Use of local anaesthetics if venipuncture is anticipated:		
Never/almost never (<10% of cases)	16 (34.8)	
Sometimes (10-50% of cases)	18 (39.1)	
Often (51-90% of cases)	6 (13.0)	
Always / almost always (>90% of cases)	6 (13.0)	

Analgesic drugs mentioned in protocol (when available):*		
Paracetamol	23 (50.0)	36 (97.3)
Non steroidal anti-inflammatory drugs	14 (30.4)	35 (94.6)
Opioids	-	27 (79.4)
Adjuvants (benzodiazepines, anticonvulsants, antihistamines)	-	17 (51.5)
Local anesthetics	13 (28.3)	30 (62.5)
Pain reassessment after analgesic therapy:		
Never/almost never (<10% of cases)		4 (9.3)
Sometimes (10-50% of cases)		13 (30.2)
Often (51-90% of cases)		14 (32.6)
Always / almost always (>90% of cases)		12 (27.9)
Parental role in the emergency room:*		
Entering with the child		43 (97.7)
Assisting painful procedures		43 (97.7)
Holding the child during blood sampling		35 (79.5)

\*Answers were not mutually exclusive.



**Table 2. PIPER Study Group's adherence effect analysis.**

	<b>Joined up to 2015</b>	<b>Joined after 2015</b>	
	<b>n (%)</b>	<b>n (%)</b>	<b>p-value</b>
Pain assessment at triage:			
No, never + sometimes	2 (8.7)	10 (45.3)	0.017
Always	21 (91.3)	13 (56.5)	
Written protocols for algometric scale at triage			
No/Yes	2 (10) / 18 (90)	9 (42.9) / 12 (57.1)	0.032
Availability of protocols for analgic therapy at triage			
No/Yes	5 (21.7) / 18 (78.3)	16 (69.6) / 7 (30.4)	0.003
Administration of drugs for pain treatment at triage			
No/Yes	7 (30.4) / 16 (69.6)	16 (69.6) / 7 (30.4)	0.017
Use of local anaesthetics before venipuncture			
In no more than 50% of cases	14 (60.9)	20 (87.0)	0.003
In more than 50% of cases	9 (39.1)	3 (13.0)	
Written protocols for pain management in emergency room			
No/Yes	7 (30.4) / 16 (69.6)	18 (78.3) / 5 (21.7)	0.017
Opioids use reported in the protocols			
No/Yes	10 (43.5) / 13 (56.5)	19 (82.6) / 4 (17.4)	0.013
Adjuvant drugs reported in protocols			
No/Yes	10 (43.5) / 13 (56.5)	19 (82.6) / 4 (17.4)	0.013

## Appendix S2.

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