Attributes of analgesics for emergency pain relief: results of the Consensus on Management of Pain Caused by Trauma Delphi initiative

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Objectives **Management of pain is suboptimal in many prehospital and emergency department settings, and European guidelines are lacking. We carried out the Consensus On Management of PAin Caused by Trauma (COMPACT) Delphi initiative to gain insights into the factors physicians consider important when selecting analgesics for trauma pain.**

Patients and methods **A pan-European panel of experts in emergency medicine or pain (*N*=31) was recruited to participate in the COMPACT Delphi initiative. In round 1, panelists supplied free-text responses to an open question about the attributes of analgesics for emergency pain relief favored by physicians. Common themes were consolidated into factors. In round 2, factors rated important by more than 75% of the panel were taken forward into round 3. In round 3, the point at which the consensus was achieved was defined *a priori* as at least 75% of panelists agreeing or strongly agreeing that a factor was important.**

Results **Twenty-nine experts participated, representing 12 European countries and with a mean (SD) of 20 (8.6) years of clinical experience. Most worked in an emergency department (79.3%). The consensus was achieved for 10 factors that were important to consider when selecting analgesics for trauma pain relief. The highest level of consensus was achieved for 'efficacy' (100%), followed by 'safety and tolerability' (96.6%), and 'ease of use' (93.1%).**

Conclusion **These findings may facilitate the development of evidence-based guidelines supporting the provision of pain management in prehospital, emergency department, and critical care settings. *European Journal of Emergency Medicine* 27: 33–39 Copyright © 2019 The Author(s). Published by Wolters Kluwer Health, Inc.**

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Keywords: analgesia, consensus, critical care, Delphi, emergency treatment, guideline, pain, preclinical, trauma

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Introduction

Pain is a primary complaint of and a reason for patients presenting to a hospital emergency department (ED), particularly in trauma. A kind and humane approach to analgesic use in trauma remains a key focus for prehospital, emergency, and critical care physicians [1,2]. Appropriate analgesia is covered by an early, effective, and safe administration of analgesics, which may help to lower a patient's stress response, reduce the length of time spent in the hospital (and thus costs), and positively influence long-term recovery and outcomes [2,3].

Although European recommendations for ED pain management are lacking, many national guidelines exist [4–7], and individual EDs may use their own analgesia protocols [8]. Numerous analgesia options are available for the relief of trauma pain, with most administered intravenously [3]. Typical systemic options include opioids (e.g. codeine, fentanyl, methadone, morphine, pethidine, and tramadol) [3], and peripheral regional analgesia (e.g. nerve blocks) [3]. In the UK, intravenous morphine is recommended first-line for patients with major trauma [7], and an international survey of 40 EDs found that intravenous morphine was used in over 90% of cases [8]. By contrast, paracetamol is the treatment of choice for Dutch trauma patients in emergency care [6]. Multimodal therapy, which uses two or more agents with different mechanisms of action [3], may include the use of the aforementioned systemic analgesics and/or anticonvulsants, antidepressants, anxiolytics, clonidine, ketamine, NSAIDs, and paracetamol [9].

Despite this broad range of analgesic options and the availability of local guidelines and protocols, pain management remains suboptimal in many emergency settings. Pain is often undertreated and pain relief is invariably unsatisfactory in prehospital and ED settings [2,3], with many patients still experiencing pain after treatment

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[10,11]. Indeed, a survey of 50 French EDs revealed that analgesics were underutilized and treatment delays common [11]. A nationwide survey of all Italian pediatric EDs also found that only one-quarter (26%) routinely assessed pain in the ED and almost half (47.7%) had no protocol for pain management [12]. Studies in Italy, Norway, and the Netherlands found that even when local pain management guidelines exist, they may not be followed routinely [12–14]. Thus, there is clear room for improvement in the management of trauma pain. This could be addressed by the development of novel analgesics or clearer guidelines regarding which pain management strategies to adopt in particular situations. This may be especially relevant in elderly or pediatric patients, for whom pain management can be particularly challenging owing to issues such as comorbid conditions and heightened anxiety [3]. Another potential barrier to successful trauma pain management is a lack of guidance in terms of ideal analgesia regimens and the most important characteristics to consider when selecting analgesics. Initiatives designed to provide such insights may help to improve the selection of treatments in these settings and to facilitate the refinement of pain management protocols used in EDs and prehospital situations.

To this end, we carried out the Consensus On Management of PAin Caused by Trauma (COMPACT) Delphi initiative among a pan-European panel of experts in emergency medicine or pain. The analysis was designed to establish what the panel considered to be the most important factors influencing their choice of analgesia for the relief of trauma pain in the prehospital, emergency room, or hospital settings.

Patients and methods

The Delphi technique is a validated methodology that uses anonymous, iterative questioning, and feedback to obtain expert consensus on a real-world topic of interest, often when published information is lacking or inadequate to provide suitable guidance [15]. The technique has been used to generate simple, yet robust, expert clinical guidance in a variety of disease settings, including the development of pain-management strategies [16,17].

Selection of the COMPACT Delphi co-Chairs and expert panel

Three global experts on trauma or emergency medicine and pain management were invited to be nonvoting co-Chairs and to select a pan-European panel of experts in emergency medicine or pain medicine. Potential panelists were recruited under the guidance of the co-Chairs, based on expertise in the field [assessed, e.g. by authorship of related publications, and/or membership of relevant European or national associations (e.g. European Society for Emergency Medicine, European Society of Intensive Care Medicine)]. Previous Delphi studies have suggested that a panel of 15–22 participants is necessary to generate consensus [15]; here, it was agreed *a priori* to invite up to 55 experts, in case of dropouts. Once nominated, the expert panel was recruited on behalf of the co-Chairs by an independent third-party administrator (Oxford PharmaGenesis, Oxford, UK), who supported the administration and coordination of the entire initiative, under the guidance of the co-Chairs. Mundipharma International Ltd (Cambridge, UK) provided funding to support the administrator's coordination of the initiative but was not involved in the planning, design or delivery of the initiative.

COMPACT Delphi process

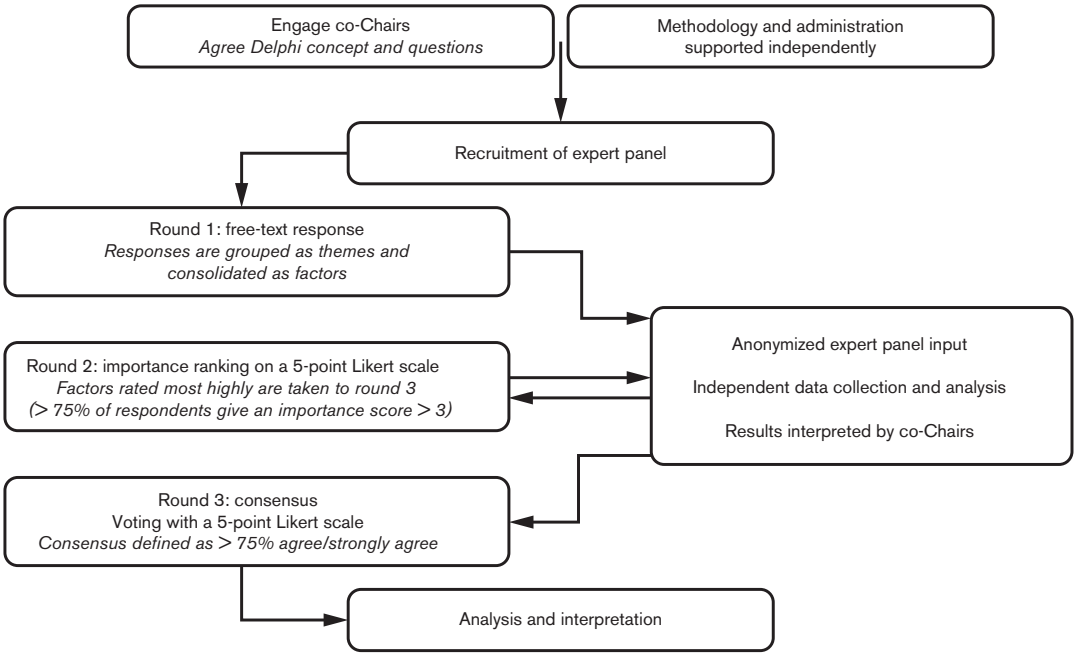
All stages of the COMPACT Delphi process were conducted by the independent third-party administrator who collated data from the expert panel on behalf of the co-Chairs. Panel responses were gathered anonymously using an online survey platform (SurveyMonkey; SurveyMonkey Europe, Dublin, Ireland) (Fig. 1). For tracking purposes, the administrator knew the identities of panel members who responded to each questionnaire, but no identifying information was shared with the co-Chairs or other panel members.

In round 1, the panel was invited to provide free-text responses to the following open question: 'What are the important factors to consider when choosing an analgesic for the relief of trauma pain in the pre-hospital, emergency room or hospital (i.e. critical care on the wards and rehabilitation) settings?'. Responses were grouped into similar themes by the independent administrator; these were then checked, revised and consolidated by the co-Chairs to produce a set of agreed factors for use in round 2.

In round 2, the expert panel was asked to rank the importance of each factor using a five-level anchored Likert scale (not important, slightly important, important, very important, and extremely important). Importance rankings were compiled by the administrator, with the co-Chairs providing expert guidance and advice. If more than 75% of the expert panel rated a factor as being important, very important, or extremely important, it was classified as being a 'provisionally important' factor to consider when choosing analgesics for the relief of trauma pain; these factors were taken forward into round 3. The remaining factors were retained as 'additional' factors to consider. All results from round 2 were shared and agreed with the co-Chairs for review and validation, before initiating round 3.

In round 3, members of the expert panel were asked to rate their level of agreement with the provisionally important factors identified in round 2. A five-point pivoted Likert scale was used (0, strongly disagree; 1, disagree; 2, neither agree nor disagree; 3, agree; and 4, strongly agree). Responses to round 3 were reviewed and validated by the co-Chairs, who provided expert guidance and advice.

Fig. 1



Overview of the COMPACT Delphi process. COMPACT, Consensus On Management of PAin Caused by Trauma.

Agreement scores for each factor were compiled by the administrator. The point at which consensus on a factor was achieved was defined *a priori* as at least 75% of the expert panel agreeing or strongly agreeing that the factor was important.

Statistical analyses

The study was exploratory only in nature; no hypothesis was tested and no statistical analyses were performed.

Results

Delphi expert panel demographics, clinical experience, and specialties

In total, 31 panelists agreed to participate in the initiative. Two potential panelists withdrew from the study before the round 1 questionnaire had been administered and were thus excluded from analyses. Members of the final expert panel ($N = 29$) represented 12 different European countries (Table 1). The mean duration of clinical experience of panel members was 20.0 years, and 34.4% had 21 to more than 30 years of clinical experience. Emergency medicine was the main specialty (41.4% of panelists), and most (79.3%) worked in an ED, with 13 (44.8%) working in prehospital care (Table 1). Approximately half (51.6%) of the panel treated 50 to at least 300 patients for trauma pain relief during a typical month, and opioids (93.1%), paracetamol (55.2%), and NSAIDs (51.7%) were used most often to manage pain (Table 1). A response rate of 100% was achieved during each round of the Delphi initiative.

Delphi initiative responses

The panel supplied a total of 112 individual free-text responses during round 1. These were grouped into 15 themes and consolidated into 15 factors following co-Chair review (two of the themes were combined into one, and one theme was split into two) for use in round 2 (Fig. 2a and Supplementary Table, Supplemental digital content 1, *http://links.lww.com/EJEM/A235*, which shows a full list of free-text response terms/themes provided in round 1 and the factors).

Following round 2, 13 of the 15 factors were categorized as being provisionally important and were taken forward into round 3 (Fig. 2b). Two factors ('type of trauma' and 'organizational or health economic considerations') did not meet the predefined importance threshold and were not taken forward into round 3. These factors were retained as 'additional factors to consider'. All panel members rated 'efficacy', 'rapid onset of action', 'safety and tolerability', and 'severity of pain' as important, very important, or extremely important; the other nine factors were rated as important, very important, or extremely important by 79–97% of panelists.

Following round 3, the panel achieved consensus that 10 factors were important to consider when choosing analgesics for trauma pain (Fig. 2c). The highest level of consensus was achieved for the factor 'efficacy' (100%), followed by 'safety and tolerability' (96.6%), and 'ease of use' (93.1%). Three factors did not meet the predefined consensus threshold [72.4% consensus each for 'clinical

Table 1 COMPACT Delphi expert panel demographics and clinical experience (*N*=29)

	n (%)
Demographics	
Country of practice	
France	5 (17.2)
Germany	4 (13.8)
Spain	4 (13.8)
UK	4 (13.8)
Belgium	3 (10.3)
Italy	3 (10.3)
Austria	1 (3.4)
Czech Republic	1 (3.4)
Denmark	1 (3.4)
Finland	1 (3.4)
Sweden	1 (3.4)
Switzerland	1 (3.4)
Main specialty	
Emergency medicine	12[a] (41.4)
Anesthesiology	10 (34.5)
Intensive care medicine	3 (10.3)
Trauma medicine	2 (6.9)
Disaster medicine	1 (3.4)
Pain medicine	1 (3.4)
Main clinical setting[b]	
Emergency department	23 (79.3)
Prehospital care	13 (44.8)
Critical/intensive care	9 (31.0)
Hospital wards	7 (24.1)
Other	3[c] (10.3)
Clinical experience	
Duration of clinical experience (years)	
Mean (SD)	20.0 (8.6)
<5	0
5–10	6 (20.7)
11–20	13 (44.8)
21–30	5 (17.2)
>30	5 (17.2)
Number of patients treated for trauma pain relief in a typical month	
<50	14 (48.3)
50–99	5 (17.2)
100–199	5 (17.2)
200–299	2 (6.9)
≥300	3 (10.3)
Analgesics typically used for trauma pain relief[b]	
Opioids	27 (93.1)
Paracetamol	16 (55.2)
NSAIDs	15 (51.7)
NMDA antagonists	10 (34.5)
Local anesthesia/block	6 (20.7)
Other	11[d] (37.9)

COMPACT, Consensus On Management of PAin Caused by Trauma; NMDA, N-methyl-d-aspartate.

[a]Includes ones participant each who described their specialty as a geriatrician in the emergency department, prehospital emergency medicine and emergency medicine, and intensive care.

[b]Participants could select more than one option.

[c]Including participants who additionally described their main clinical setting as operating theater (*n*=3), administration (*n*=1), anesthesiology (*n*=1), and multidisciplinary pain management unit (*n*=1).

[d]Including nitrous oxide, benzodiazepines, propofol, antihypertensive agents, and antiepileptic agents.

experience of/familiarity with analgesics' and 'pharmacokinetic (PK) and pharmacodynamic (PD) considerations'; 58.6% for 'potential for allergic reaction'], but were retained as 'additional factors to consider'.

Discussion

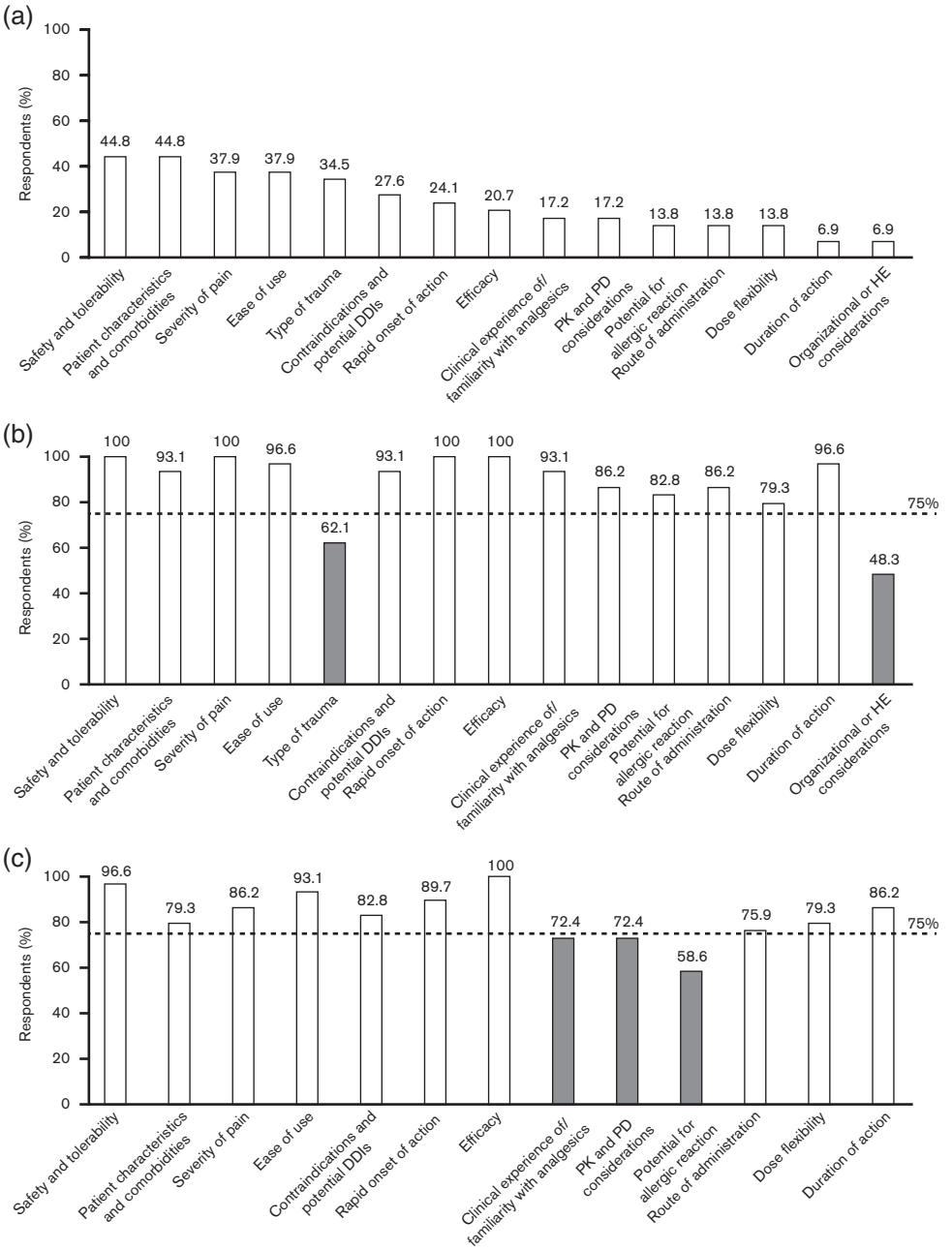
In response to the question: 'What are the important factors to consider when choosing an analgesic for the relief of trauma pain in the prehospital, emergency room or hospital settings?', the COMPACT Delphi expert panel reached consensus on 10 factors. Perhaps, unsurprisingly, the panel rated 'efficacy' (100% agreement) and 'safety and tolerability' (96.6% agreement) as the two most important factors. The overall ranking of factors in round 3 also made sense from a clinical perspective. For example, 'ease-of-use' was rated as the third most important factor (93.1% agreement), followed by 'rapid onset of action' (89.7% agreement), then 'severity of pain' and 'duration of action' (both with 86.2% agreement). Many analgesics used for trauma pain are required to be administered intravenously by trained staff, so there may remain a need for easy-to-use pharmacological options for emergency pain relief. Furthermore, most opioids – the mainstay of trauma pain relief – have a relatively slow onset of action (typically 15–60 min) [3], suggesting that there may also be a need for agents that can provide more rapid analgesia in emergency settings. An alternative approach could be to use inhaled agents, which have been shown to provide rapid pain relief to trauma patients [18].

By contrast, it was perhaps surprising that the factors 'PK and PD considerations' and 'potential for allergic reaction' did not meet the consensus threshold in round 3. One possible explanation for this apparent inconsistency is that panel members may have perceived these factors to be too narrow, eschewing them in favor of broader factors that encompassed them, such as 'efficacy', 'rapid onset of action', 'duration of action', and 'safety and tolerability'.

Few studies have examined the relative efficacy and safety of analgesics used in emergency care, which may explain, in part, why evidence-based guidelines are lacking. However, in a large systematic review examining the effectiveness and safety of pharmacological agents in trauma patients in the Netherlands, the authors concluded that paracetamol and opioids were well tolerated and effective [19], which aligns with the finding that our panel tended to use these two agents the most for managing trauma pain. By contrast, NSAIDs showed mixed effects and were not recommended for use in emergency care [19].

By identifying important factors to consider when selecting analgesics for trauma pain relief, the results of this initiative may help physicians to refine analgesia protocols and ultimately to improve the management of trauma pain. Indeed, a key facilitator to improving pain management is having a single guideline for pain management that can be used throughout the chain of emergency care, whereas inadequate protocols and a lack of consensus-based perspectives on pain management are significant barriers [20]. At present, there are no agreed European guidelines for the management of trauma pain. This may be due, at least in part, to the different emphasis placed on pharmacological and nonpharmacological pain relief by different healthcare workers and systems. Provision of appropriate guidelines could help to address

Fig. 2



COMPACT Delphi results for round 1 (a), round 2 (b) and round 3 (c) (***N***=29). (a) The proportion of respondents who mentioned each factor in their free-text responses during round 1 of the Delphi initiative. Please see Supplementary Table (Supplemental digital content 1, *http://links.lww.com/EJEM/A235*) for a full list of the free-text response terms/themes provided in round 1 and their respective factors, which were taken forward into round 2. (b) The proportion of respondents who rated each factor as being important, very important, or extremely important during round 2 of the Delphi initiative. If more than 75% of the expert panel rated a factor accordingly (dashed line), it was classified as a provisionally important factor to consider when choosing analgesics for the relief of trauma pain, and was taken forward into round 3 (white bars). (c) The proportion of respondents who agreed or strongly agreed that the factor was important to consider when choosing analgesics for the relief of trauma pain (Delphi initiative round 3). If more than 75% of the expert panel agreed that a factor was important (dashed line), the consensus was achieved (white bars). COMPACT, Consensus On Management of PAin Caused by Trauma; DDI, drug–drug interaction; HE, health economic; PD, pharmacodynamic; PK, pharmacokinetic.

sources of variation in trauma practice. It is important to note, however, that development and refinement of pain management protocols alone will not address current unmet needs, because many other barriers to effective pain management exist. For example, physicians will invariably have to prioritize treatment of life-threatening

injuries over pain (highlighting the importance of easy-to-use analgesics); some physicians may be reluctant to use validated pain scales or have doubts regarding patients' actual levels of pain, and approved protocols may not offer sufficient or adequate pharmacological options [20].

A particular strength of this research (and Delphi initiatives in general) is that the findings reflect real-world evidence and experience, as opposed to the more rigidly controlled environments of clinical trials. This can be a valuable strategy for generating guidelines in situations such as this, where level 1 evidence is lacking. Although the Delphi technique aims to minimize the potential noise and data distortion that can arise during conventional group interactions [15], there can be drawbacks to using the technique. For example, regression to the mean is likely, which can dilute insightful or nuanced responses suggested by individual panel members. However, the approach rules out the potential for individual bias and thus may be considered a strength.

Trauma in the prehospital, emergency room, and hospital settings encompasses a diverse medical spectrum. Certain factors identified by this Delphi process, such as the rapidity of onset of action, are perhaps most relevant to initial trauma management in the emergency setting. Additional research into which analgesics are effective and tolerable in various clinical situations and in different country-specific ED settings would be useful, as would studies investigating which analgesics meet each of the other eight factors identified by our panel. It is important to note that analgesics may be used in combination and their cumulative effects and potential interactions must be considered. The views of nonphysician healthcare workers integral to trauma care, such as emergency nurses, would also offer a valuable contribution to pain management.

Conclusion

The COMPACT Delphi initiative identified 10 factors that are important to consider when selecting analgesics for trauma pain relief. Efficacy, safety/tolerability, ease of use, onset/duration of action, pain severity, and contraindications/potential for drug–drug interactions were ranked as the most important factors. These findings may facilitate the development of evidence-based guidelines or algorithms supporting the provision of pain management in prehospital, ED, and critical care settings.

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Conflicts of interest

Keith Porter has received honoraria for speaker's activities from Mundipharma International Ltd. Bart Morlion

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