

CRITICALLY APPRAISED PAPER

TITLE

Use of the Cognitive Orientation to daily Occupational Performance (CO-OP) approach resulted in improved performance on self-selected goals for children with acquired brain injury (ABI).

AUTHOR

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CLINICAL SCENARIO

Acquired brain injury (ABI) is a common paediatric condition in Australia, affecting an estimated 22,800 children in 2003 (Australian Bureau of Statistics Survey of Disability, Ageing and Carers 2003, as cited in Rushworth 2008, p. 2). Children with ABI may experience a variety of limitations in their daily functioning as a result of their injury. Executive dysfunction is a common sequelae (Spikman, Boelen, Lamberts, Brouwer & Fasotti, 2010), and is a major contributor to the difficulties experienced by children following brain injury. Despite the high prevalence of executive difficulties experienced by children with ABI, there are few evidence-based practical guidelines to inform occupational rehabilitation with this client group (Teplicky et al., as cited in Missiuna et al., 2010, p. 207).

FOCUSSED CLINICAL QUESTION

Does the CO-OP approach improve problem-solving skills and functional performance for children with ABI?

SUMMARY OF SEARCH

A comprehensive database search was conducted and one study is included in this review. One article was found specifically focusing on the use of the CO-OP approach for children with ABI (Missiuna et al., 2010). Participants ranged in age from six to fifteen years and participated in a ten-week program that targeted individually selected goals using the CO-OP approach. Preliminary evidence suggests that the CO-OP approach and similar metacognitive strategies have the potential to be beneficial interventions for children with ABI. Overall, results indicated that use of a goal-directed metacognitive intervention resulted in improved performance in chosen goals, however improvements were inconsistent and use of the problem-solving strategy was not generalised to goals not targeted in intervention.

CLINICAL BOTTOM LINE

There is emerging evidence to support the use of the CO-OP approach to improve the functional performance of children with ABI; however, more research is required to determine the specific components of a cognitive approach that influence improved functional outcomes, and whether or not this approach can generalise to activities beyond those specifically targeted in therapy.

Important note on the limitation of this CAT

This critically appraised paper (or topic) has been peer-reviewed by one other independent lecturer

SEARCH STRATEGY

Terms used to guide the search strategy					
<ul style="list-style-type: none"> - <u>P</u>atient/Client Group: Children (< 18 years) with a diagnosis of ABI - <u>I</u>ntervention (or Assessment): CO-OP or similar meta cognitive strategy - <u>C</u>omparison: Any - <u>O</u>utcome(s): Improved occupational performance, improved problem-solving ability 					
Databases and Sites Searched	Search Terms				Limits Used
	Population		Intervention	Outcome	
	Age group	Diagnosis			
CINAHL AMED Medline OTSeeker PsychINFO ProQuest Health and Medical Complete	Child* Youth Adolescent* "Young adult*" Paediatric Pediatric "School-aged" Teenage* Preschool* Pre-school* Young Early years Early learning years Primary school Elementary school Kids Early education Kindergarten High-school* Student*	"Acquired brain injur*" ABI TBI "Traumatic brain injur*" "Head injur*" "Head trauma" "Brain injur*" "Brain damage" "Closed head injur*" Stroke CVA "Cerebrovascular accident" "Intracranial injur*" Focal brain injur* Primary brain injur* Diffuse brain injur* Hypoxic brain injur* Executive dysfunction Brain trauma "Acquired head injur*" Brain tumour* Brain haemorrhage	"CO-OP" "Cognitive Orientation to daily Occupational Performance" "Cognitive Orientation to Occupational Performance" "Cognitive intervention*" "Cognitive strateg*" "Metacognitive strateg*" "Meta-cognitive strateg*" Metacognitive intervention "Cognitive rehabilitation" Global problem-solving strateg* Goal attainment strateg* Goal achievement strateg* "Goal directed" "Goal set*" Cognitive therapy strateg*	"Problem-solving skills" "Problem-solving" "Improved problem-solving" "Problem-solving strateg*" "Occupational performance" "Motor learning" "Motor planning" "Organi*ed movement" Problem-solving skills Problem solving skills Goal attainment Goal setting Goal achievement Participation in occupation Independence in occupation Increased problem-solving skills Problem-solving abilit* Problem-solving capacit* Motor-based skills Motor skill* Executive function*	Published between 2000 and 2011 Written in English Peer reviewed

INCLUSION and EXCLUSION CRITERIA

Inclusion Criteria
<ul style="list-style-type: none"> - Studies investigating the use of the CO-OP approach for children with ABI. - Studies investigating comparable cognitive interventions for children with ABI. - Studies published in English between 2000 and 2011. - Problem-solving skills and/or functional improvement as a primary outcome.

Exclusion Criteria
- Studies published prior to 2000.

RESULTS OF SEARCH

A total of 15 studies were located and categorised as shown in Table 1 (based on Levels of Evidence, Centre for Evidence Based Medicine, 2011)

Table 1: Summary of Study Designs of Articles Retrieved

Study Design/Methodology of Articles Retrieved	Level	Number Located	Author (Year)
Systematic reviews	1	0	-
Randomised trials, observational studies with dramatic effect	2	3	Chan, 2011 Miller, 2001 Wade, 2010
Non-randomised controlled cohort/follow-up studies Pre-to-post test	3	2	Missiuna, 2010* Sangster, 2005
Case series, case control studies	4	10	Bernie, 2004 Dawson, 2009 Mandich, 2001 Phelan, 2009 Rodger, 2007 Rodger, 2009 [1] Rodger, 2009 [2] Rodger, 2010 Taylor, 2007 Ward, 2004
Mechanism-based reasoning	5	0	-

* Denotes study chosen for this review.

BEST EVIDENCE

The following study was identified as the 'best' evidence and selected for critical appraisal.

Reason for selection:

1) Missiuna, C., DeMatteo, C., Hanna, S., Mandich, A., Law, M., Mahoney, W., & Scott, L. (2010). Exploring the use of cognitive intervention for children with acquired brain injury. *Physical & Occupational Therapy in Pediatrics*, 30(3): 205 – 219.

This study was selected as it specifically investigated the use of the CO-OP approach for children with ABI.

SUMMARY OF BEST EVIDENCE

Table 2: Description and appraisal of the study by **Missiuna et al., 2010**

Aim/Objective of the Study/Systematic Review:
The objective of this study was to explore the use of the Cognitive Orientation to daily Occupational Performance (CO-OP) approach for school-aged children with ABI. CO-OP is a short-term, evidence-based cognitive intervention that aims to improve children's performance in everyday tasks through problem-solving and the discovery of cognitive strategies.

The aims of this study included:

1. Explore the applicability of CO-OP intervention for paediatric ABI.
2. Assess the level of change in functional performance following CO-OP intervention.
3. Monitor to determine if changes are maintained after four months.

Study Design

Pre-to-post test design.

Setting

Participants were recruited from a tertiary care centre located in Ontario, Canada. Intervention sessions took place either in the research facility, allowing for parent observation, or in participants' homes. The number of sessions completed in each setting over the course of the study was not specified.

Participants

N = 6

Diagnosis: ABI

Age range: 6 years 11 months to 15 years 9 months (M = 9.8, S.D. = 3.06)

Gender: 5 males, 1 female

Time since injury: Ranged from 6 to 15 months post-injury

Injury severity: All participants had sustained moderate injuries (Glasgow Coma scale (GCS) score of 9 to 12).

Three of the children sustained injuries as result of motor vehicle accidents, two fell from haylofts, and one was injured by a falling mantelpiece.

Eligibility criteria:

- Aged between 6 and 15 years
- Participants sustained a mild to moderate brain injury (a score of 9-15 on the GCS at the time of hospital admission)
- Attending school full time without the assistance of an educational attendant
- Recorded scores of five or less on two or more sections of the School Function Assessment (Coster, Feeney, Haltiwanger & Haley, 1998).

Recruitment: Using the eligibility criteria listed above, 17 children from the 'Transitions' study, a longitudinal study investigating points of transition for children with ABI (DeMatteo & Hanna, 2005), were invited to participate. No information was provided as to how these participants were selected. Of the 17 invitees, ten children and their parents consented to participate; only six of whom completed the study (a response rate of 35.5%).

Two children were withdrawn from the study after assessment deemed them unsuitable to receive CO-OP intervention (one due to cognitive limitations, one due to refusal to participate). Two more children dropped out of the study, one due to co-intervention and the other because they could not meet all the session requirements.

Intervention Investigated

Control

None

Experimental

CO-OP intervention

Each participant received ten individual one-hour sessions of CO-OP intervention. Sessions were scheduled once per week and occurred either at home or in the clinic. Six experienced paediatric Occupational Therapists with training in the CO-OP approach conducted the intervention sessions. A different therapist worked with each child.

Each therapist was required to keep structured logs of their intervention sessions to ensure adherence to the CO-OP protocol. Sessions were regularly observed by two of the researchers, and session logs were also

monitored. Two of the treating therapists, who were less experienced in using the CO-OP approach, were required to discuss and plan each intervention session with the principal researcher. All videotaped sessions and logs were analysed to determine any differences in the “features of the original CO-OP model...and the CO-OP intervention used in this study with children with ABI” (Missiuna et al., 2010, p. 212).

Methods:

Pre-intervention

Each child was assisted by the treating therapist to select three tasks that they “needed to, wanted to, or was expected to perform and that was currently difficult” (Missiuna et al., 2010, p. 210). The Canadian Occupational Performance Measure (COPM) was administered with children over the age of nine years to identify three tasks to be targeted during intervention. Two children under the age of nine used the Perceived Efficacy and Goal Setting System (PEGS) to identify their three target tasks. Children were videotaped performing their three target tasks to obtain baseline data.

Parents of all children used the COPM to rate their child’s performance of each target task, and their satisfaction with their child’s performance of each task. As only child-chosen goals were to be targeted during intervention, parents were not required to set goals using the COPM.

The Vineland Adaptive Behaviour Scales (VABS) were also administered with parents over the phone.

Intervention

- Children were taught the *Goal-Plan-Do-Check* strategy, and applied this strategy while performing their three target tasks.
- The therapist “guided the child in the discovery of task-specific strategies that were required for performance” (Missiuna et al., p. 211). Children were encouraged to verbalise discovered strategies to help guide their task performance, and to assist with strategy learning.
- Transfer/generalisation was encouraged through the use of bridging techniques, such as guided questioning (i.e. “What else could you use this strategy for?”).
- Children and therapists utilised footage of first, middle and final sessions to help summarise and consolidate learning.

Post- intervention

One week after the completion of intervention, the child was videotaped performing the three target tasks chosen at pre-intervention, and their performance was rated using the Performance Quality Rating Scale (PQRS). The COPM was readministered with child and parent, and the VABS was readministered with the parent.

Follow-up

After four months, the procedure followed at post-intervention was repeated.

Outcome Measures (Primary and Secondary)

1) Vineland Adaptive Behaviour Scales (VABS) (Sparrow, Balla, & Cicchetti, 1984):

This interview-based evaluation was completed by participants’ parents to rate their children’s social competency and daily living skills. The research coordinator administered the VABS with participants’ parents over the phone prior to first intervention session, and again at post-intervention and follow-up. The VABS covers the following domains/sub domains:

- **Communication:** Receptive, expressive, and written language
- **Daily living skills:** Personal, domestic, and community interaction
- **Social competency:** Interpersonal relationships, play and leisure, coping skills
- **Motor:** Gross and fine motor skills.

Standard scores are calculated for each domain, and then summed to obtain the adaptive behaviour composite score. Items within sub-domains are scored according to whether the item activity occurs usually (2), sometimes or partially (1), never (0), or don’t know (DK).

2) Canadian Occupational Performance Measure (COPM) (Law et al., 2005):

This semi-structured interview was used to assist participants to identify functional goals to work on in therapy, and to rate their perceived performance and satisfaction prior to commencing intervention. The treating therapist administered the COPM at pre- and post-intervention, and at follow-up.

The COPM is designed to detect change in a client’s self-perception of their occupational performance over time. For this study, participants identified three target tasks then rated each task on a scale of 1 to 10, where:

Performance: 1 = not able to perform the task, to 10 = able to complete the task competently,

Satisfaction: 1 = not satisfied with performance, to 10 = extremely satisfied with performance.

Performance and satisfaction scores are summed and averaged over the number of identified goals to produce

scores out of 10. A difference between the baseline and follow-up score of two points or more is considered clinically significant (Carswell et al., 2004).

3) Performance Quality Rating Scale (PQRS) (Martini, 1994):

This scale was used to evaluate target tasks recorded on videotape.

A student occupational therapist watched videotapes of children's performance of their target tasks, and rated their task performance on a scale from 1 (child unable to perform the task) to 10 (competent task performance). Videotapes were recorded at pre-intervention, post-intervention and follow-up, with the student occupational therapist blinded to time point.

4) Perceived Efficacy and Goal Setting System (PEGS) (Missiuna, Pollock, & Law, 2004):

This picture card based system was used to assist participants aged five to nine years to identify target tasks for therapy. Children are shown pictures of a child performing well at a common activity, and a child having difficulty with the activity, and are asked to identify which child they are most similar to. As PEGS is primarily a goal-setting tool, it does not include ratings of performance and satisfaction.

The treating therapist administered the PEGS with selected participants at pre-intervention only.

Main Findings

The following data was provided by the original authors:

Table 4: Children's task performance before and after intervention, and at follow-up. (Missiuna et al., 2010, p. 214).

Measure	Pre-intervention Mean (SD)	Post-intervention Mean (SD)	Follow up at 4 months Mean (SD)	ANOVA (F value)
COPM (parent rated)				
Performance	3.97 (1.7)	6.33 (2.2)	7.83 (1.0)	30.21**
Satisfaction	3.52 (1.9)	6.33 (2.4)	8.72 (0.65)	58.65**
PQRS	2.53 (0.90)	4.73 (1.01)	5.47 (0.84)	34.57**
VABS Standard scores				
Composite	115.67 (15.52)	124.83 (12.60)	129.83	8.3**
Communication	79.5 (7.71)	87.0 (5.89)	92.33 (3.14)	10.17**
ADLs	82.83 (14.87)	89.33 (11.21)	94.83 (10.65)	12.69**
Social	90.0 (8.82)	96.83 (4.30)	109.67 (13.84)	4.38*

Significant time effect at *p < .05, ** p < .01

Table 5: Mean changes over time for COPM, PQRS and VABS: Parent report.

Measure	F value	p value
COPM		
Performance	F (2,10) = 30.21	p < .001
Satisfaction	F (2,10) = 58.65	p < .001
PQRS	F (2,10) = 34.57	p < .001
VABS		
Composite	F (2,10) = 8.3	p < .008
Communication	F (2,10) = 10.17	p < .004
ADL	F (2,10) = 12.69	p < .002
Social	F (2,10) = 4.38	p < .043

Data from Missiuna et al., 2010, p.214.

As statistical significance was not reported for change in the child's self-rated COPM scores, an approximate difference between the two means was calculated by using scores derived using the graph in Figure 2 (Missiuna et al., 2010, p.214). The following results were calculated using PEDro Confidence Interval (CI) Calculator (retrieved from <http://www.pedro.org.au/english/downloads/confidence-interval-calculator/>) and significance was judged based on 95% confidence intervals.

Table 6: Reviewer calculated confidence intervals for COPM, PQRS and VABS composite scores.

COPM			PQRS	VABS Composite
	Performance	Satisfaction	2.2 (CI 95%: - 3.43 to - 0.97)*	- 9.16 (CI 95%: - 27.34 to 9.02)
Child rated	- 4.1 (CI 95%: - 6.72 to - 1.48)*	- 5.525 (CI 95%: - 7.93 to - 3.12)*		
Parent rated	-2.36 (CI 95%: - 4.89 to 0.17)	- 2.81 (CI 95%: - 5.59 to - 0.03)*		

*Significant result

Original Authors' Conclusions

- Children improved their ability to “perform their self-identified goals throughout the course of the study” (Missiuna et al., 2010, p. 218).
- No evidence was found that children could recall and apply the *Goal, Plan, Do, Check* (GPDC) problem-solving strategy to tasks other than those targeted in intervention, but participants did retain and use some cognitive strategies that could be generalised across tasks.
- The CO-OP approach required some alteration for use with this population. Important areas identified by treating therapists included “‘making it fun,’ ‘taking one thing at a time,’ ‘working towards independence’ and ‘guided discovery’” (Missiuna et al., 2010, p. 215). Areas identified as requiring alteration were “‘framing it in the GPDC structure’ and ‘promote good strategy use’” (Missiuna et al., 2010, p. 215).
- “Parent/caregiver involvement seemed to be important in enabling strategy use with children with ABI” (Missiuna et al., 2005, p. 217).
- Further examination of this intervention is needed to better understand its potential clinical application for children with ABI. Results of this study are limited by the small sample size.

Critical Appraisal

Validity

Limitations

- Lack of control group or comparison group.
- Small sample size (N = 6).
- Therapists made changes to the original CO-OP protocol for use with this population.
- Statistical comparisons between adjacent time points were not used.
- Homogeneity of the sample - 5 of the 6 participants were male.
- Location of individual intervention sessions varied between facility and home-based settings, which may have affected the results. This was not accounted for in the analysis of outcomes.

Potential biases

- Attention bias may have lead to a direction of positive results. Given that parents were aware of the study purpose and were one of the sources of feedback for the study, they may have anticipated greater improvement/change in their child’s functioning given their knowledge of the aims of the intervention. The authors noted that this bias may have occurred.
- It is possible that parent’s scores of child’s functional abilities were higher than those from videotape analysis, as parents were asked to rate this based on their child’s performance in the home environment when parental help was available.
- Selection bias may be in effect, with a positive direction of influence on results. Recruitment was non-randomised and participants were drawn from a small sample associated with another trial. This may have positively impacted the outcomes, as higher performing participants may have been selected and participation in multiple studies suggests an increased interest in and motivation towards improving one’s condition.

Missing information

- Not all outcome measures were fully reported. The authors excluded results from the children’s COPM and PEGS, and did not report scores for the motor skills domain of the VABS. Statistical analysis was only applied to data provided by participants’ parents.
- No information regarding injury site, cognitive function post-injury, or current occupational performance issues was provided.

Interpretation of Results
<p>The results indicated a consistent pattern of improvement from pre-to post-intervention in children’s ratings of performance and satisfaction on the COPM, and performance quality scores on the PQRS. All children maintained improvements at follow-up measurement. Parent report showed clinically and statistically significant ($p < 0.05$) improvement on the COPM and VABS at post-intervention and follow-up. These findings suggest that the CO-OP approach can assist children with ABI to problem-solve and develop cognitive strategies to improve their functional performance in self-chosen goals.</p>
Summary/Conclusion
<p>Rehabilitation for children with ABI is moving towards addressing executive dysfunction through cognitive interventions in order to improve occupational performance and participation (Missiuna et al., 2010; Chan & Fong, 2011). The results of this study support the use of the CO-OP approach with this client population; however, further research using a larger sample size is required to determine the efficacy of this approach for children with ABI.</p> <p>As children with ABI often have diffuse injuries that result in a complex presentation of dysfunction across more than one area, clinicians should be aware of the possible limitations and challenges of applying the CO-OP approach with this population of children. Children need to be carefully selected for use of the CO-OP approach to ensure they have sufficient cognitive, motor and verbal abilities. Further research is required to more clearly define the abilities that are required for children with ABI to effectively engage in this intervention. Education and involvement of family members, teachers and significant others in applying the CO-OP approach consistently across settings may support the child’s ability to generalise and maintain learned skills.</p> <p>The results indicate that the use of the CO-OP approach with children with ABI has the potential to produce significant clinical benefits. The strategy may require some alterations for use with this population, as therapists noted that the children responded more positively to, and retained certain aspects of the CO-OP strategy better than others. These aspects could be highlighted in adaptations for use with children with ABI. The study provides good evidence to support a larger scale clinical trial of this intervention with a paediatric ABI population.</p>

Table 3: Characteristics of included study

	Study 1 Missiuna et al., 2010
Intervention investigated	CO-OP
Comparison intervention	None
Outcomes used	VABS, COPM, PQRS, PEGS
Findings	<ul style="list-style-type: none"> - Children improved their ability to perform self-chosen tasks over the course of intervention. - Significant improvements were observed in children’s ratings of performance and satisfaction on the COPM, and on the PQRS. - Children were unable to recall and use the <i>Goal-Plan-Do-Check</i> problem-solving strategy, but were able to generate alternative cognitive strategies to guide task performance. - Some alterations were made to the original CO-OP protocol for use with this population. - Further research is required to confirm these results.

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

IMPLICATIONS FOR PRACTICE

The article reviewed provides evidence to suggest that the CO-OP approach has potential to be a successful intervention for improving the occupational performance of children with ABI.

During the development of the CO-OP strategy, Polatajko et al. (2001) identified five prerequisites that must be present in order for intervention to be beneficial for the child. These include the presence of sufficient cognitive and language abilities to set goals on the COPM, the ability to identify occupational goals, the ability to respond and attend to the therapist, the potential to perform the chosen task, and the motivation to learn three skills (p. 111 - 112).

Galvin et al. (2010) addressed the first prerequisite regarding the ability of children with ABI to set goals using the COPM. This study found that children with an ABI have the capacity to identify goals for therapy using standardised outcome measures, such as the COPM and PEGS. However, clinicians should consider that due to cognitive issues affecting language, attention, concentration and memory, children with ABI may require more time and assistance to set goals (Middleton, 2008).

Occupational therapists, parents and children should anticipate that due to the presence of additional issues with physical and cognitive impairment commonly experienced within the ABI population, children may require more intensive intervention than described in CO-OP protocol. Polatajko et al. (2001) noted the importance of involving the child's family and significant others in CO-OP intervention. Family members, teachers and carers should be educated in the use of the CO-OP approach, and how the strategy can be applied in their particular setting to promote the generalisation of skills (Phelan, Steinke & Mandich, 2009).

Chan and Fong (2011) investigated the use of a meta cognitive intervention similar in structure and content to the CO-OP approach with children following brain injury. Intervention involved the use of an explicit problem-solving skills training program based on meta-cognitive principles, and outcomes were compared with usual care methods (no active rehabilitation). Outcome measures taken post-intervention showed significantly greater improvements in the experimental group in the areas of abstract reasoning, metacomponential functioning, goal directed functional behaviour and self perception of their performance in real life situations.

Researchers concluded that the training program investigated was applicable to children with ABI in mainstream schools. However, researchers also concluded that the generalisation of the metacognitive strategy to real life situations needs further investigation.

This preliminary evidence suggests that the CO-OP approach and other meta-cognitive approaches have potential to be beneficial interventions for the paediatric ABI population. Clinicians should be aware of the possible limitations and challenges of applying the CO-OP approach with this population, and carefully select clients for whom it may be appropriate, based on cognitive, motor and verbal abilities. Further research is required to validate the use of the CO-OP approach for children with ABI, and to define the client characteristics that would generate the best functional outcomes.

FUTURE RESEARCH

Further large-scale quantitative research into the use of the CO-OP approach with children with ABI is required to determine its efficacy in improving problem-solving strategy generation and occupational performance. Results of the few studies focusing on the use of cognitive intervention within a paediatric ABI population show cause for future research using higher quality methodology to validate its use in a clinical setting. Future randomised controlled trials with larger sample sizes and comparison conditions are required to confirm results obtained by Missiuna et al. (2010) that suggested CO-OP intervention was successful in promoting functional improvements in children with ABI. Trials should incorporate the use of assessor blinding to reduce biases that may positively influence the results of children receiving CO-OP intervention.

Current research into the use of cognitive interventions for ABI has focused on those with intact verbal and sensory skills who demonstrate cognitive impairments (Missiuna et al., 2010, Dawson et al., 2009, Chan & Fong, 2011). Investigation is required to determine if the CO-OP approach is feasible for use with children with lower-level verbal capacities, sensory deficits and more severe cognitive impairments.

Research conducted by Missiuna et al. (2010) suggests that certain elements of the CO-OP approach were more successful than others. Four of the six enabling strategies described by Polatajko et al. (2001) were considered useful by the therapists who administered CO-OP intervention with children with ABI. In order to increase the effectiveness of the CO-OP intervention with this population, further investigation into the specific elements that produce successful functional outcomes is required.

Missiuna et al. (2010) found no evidence that children with ABI could recall and apply the *Goal-Plan-Do-Check*

strategy integral to the CO-OP approach. However, findings indicated that despite this, children were able to generate and apply alternative strategies to assist their task performance, and these were often generalised across a number of tasks (Missiuna et al, 2010). Future studies could include investigation into whether the use of visual and verbal prompts increases the child's ability to recall and apply the *Goal-Plan-Do-Check* strategy. Though more research is required, clinicians can be optimistic about the successful use of the CO-OP with appropriate members of the paediatric ABI population.

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