

Effectiveness of family-centred educational interventions for anxiety, pain and behaviours of children and adolescents and anxiety of their parents during the perioperative journey: A systematic review and meta-analysis

Supplement 1: Search strategy

MEDLINE (via PubMed)

Search conducted on 13 April 2021.

Search	Query	Records retrieved
#1	adolescen*[Title/Abstract] OR teen*[Title/Abstract] OR youth[Title/Abstract] OR child*[Title/Abstract] OR paediatric*[Title/Abstract] OR pediatric*[Title/Abstract] OR parent*[Title/Abstract] OR mother*[Title/Abstract] OR father*[Title/Abstract] OR "early adulthood"[Title/Abstract] OR "young adulthood"[Title/Abstract] OR Family[Title/Abstract] OR Caregiver*[Title/Abstract] OR Care-giver[Title/Abstract] OR Carer*[Title/Abstract]	2942362
#2	Surg*[Title/Abstract] OR "pre-operative"[Title/Abstract] OR Pre-operative[Title/Abstract] OR Perioperative[Title/Abstract] OR post-operative[Title/Abstract]	2358782
#3	"audiovisual aids"[Title/Abstract] OR book* OR multimedia* OR hypermedia OR pamphlet* OR education OR "teaching session"[Title/Abstract] OR DVD OR "digital versatile disc"[Title/Abstract] OR video* OR leaflet* OR "non-pharmacological intervention"[Title/Abstract] OR "nonpharmacological intervention"[Title/Abstract] OR "Complementary Therapy"[Title/Abstract] OR "family centered care"[Title/Abstract] OR "family centred care"[Title/Abstract]	2095378
#4	pain*[Title/Abstract] OR anxiety[Title/Abstract] OR behaviour[Title/Abstract] OR behavior[Title/Abstract] OR STAI[Title/Abstract] OR "FLACC"[Title/Abstract] OR "visual analog scale"[Title/Abstract]	1784997
#5	"Adolescent"[Mesh] OR "Minors"[Mesh] OR "Child"[Mesh:NoExp] OR "Child, Preschool"[Mesh] OR "Family"[Mesh:NoExp] OR "Parents"[Mesh] OR "Mothers"[Mesh] OR "Fathers"[Mesh] OR "Caregivers"[Mesh:NoExp]	3209023
#6	"Elective Surgical Procedures"[Mesh] OR "Surgical Procedures, Operative"[Mesh:NoExp] OR "pre-operative care"[Mesh] OR "perioperative care"[Mesh] OR "post-operative care"[Mesh]	217009
#7	"Hypermedia"[Mesh] OR "Education"[Mesh:NoExp] OR "Teaching"[Mesh:NoExp] OR "Teaching Materials"[Mesh:NoExp] OR "Audiovisual Aids"[Mesh:NoExp] OR "Multimedia"[Mesh] OR "Videotape Recording"[Mesh] OR "Books"[Mesh:NoExp] OR "Pamphlets"[Mesh:NoExp] OR "Complementary Therapies"[Mesh:NoExp]	117172
#8	"Pain"[Mesh:NoExp] OR "Pain, Post-operative"[Mesh:NoExp] OR "Anxiety"[Mesh:NoExp] OR "Acute Pain"[Mesh] OR "Behavior"[Mesh:NoExp]	288558
#9	#1 OR #5	4711539
#10	#2 OR #6	2414594
#11	#3 OR #7	2110674
#12	#4 OR #8	1855885
#13	#9 AND #10 AND #11 AND #12	4751
#14	Filters: Limited to from 2007/01/01	3219
#15	Languages: English, Spanish and Portuguese	3103

CINAHL (via EBSCOhost)

Search conducted on 13 April 2021.

Search	Query	Records retrieved
#1	TI (adolescen* OR teen* OR youth OR child* OR paediatric* OR pediatric* OR parent* OR mother* OR father* OR "early adulthood" OR "young adulthood" OR Family OR Caregiver* OR Care-giver OR Carer*) OR AB (adolescen* OR teen* OR youth OR child* OR paediatric* OR pediatric* OR parent* OR mother* OR father* OR "early adulthood" OR "young adulthood" OR Family OR Caregiver* OR Care-giver OR Carer*)	227 285
#2	TI (Surg* OR "pre-operative" OR Pre-operative OR Perioperative OR post-operative) OR AB (Surg* OR "pre-operative" OR Pre-operative OR Perioperative OR post-operative)	255 490
#3	TI ("audiovisual aids" OR book* OR multimedia* OR hypermedia OR pamphlet* OR education OR "teaching session" OR DVD OR "digital versatile disc" OR video* OR leaflet* OR "non-pharmacological intervention" OR "nonpharmacological intervention" OR "Complementary Therapy" OR "family centered care" OR "family centred care") OR AB ("audiovisual aids" OR book* OR multimedia* OR hypermedia OR pamphlet* OR education OR "teaching session" OR DVD OR "digital versatile disc" OR video* OR leaflet* OR "non-pharmacological intervention" OR "nonpharmacological intervention" OR "Complementary Therapy" OR "family centered care" OR "family centred care")	78 290
#4	TI (pain* OR anxiety OR behaviour OR behavior OR STAI OR "FLACC" OR "visual analog scale") OR AB (pain* OR anxiety OR behaviour OR behavior OR STAI OR "FLACC" OR "visual analog scale")	274 223
#5	MM "Adolescence" OR MM "Child" OR MM "Child, Preschool" OR MM "Minors (Legal)" OR MM "Family" OR MM "Parents" OR MM "Mothers" OR MM "Fathers" OR MM "Caregivers"	86 873
#6	MM "Pre-operative care" OR MM "Surgery, Elective" OR MM "Post-operative care" OR MM "Perioperative care" OR MM "Ambulatory Surgery"	28 793
#7	MM "hypermedia" OR MM "multimedia" OR MM "education" OR MM "teaching" OR MM "teaching materials" OR MM "pre-operative education" OR MM "Teaching: Pre-operative (Iowa NIC)" OR MM "Teaching materials, clinical" OR MM "books" OR MM "electronic books" OR MM "print materials" OR MM "pamphlets" OR MM "Alternative Therapies"	37 141
#8	MM "Post-operative pain" OR MM "Pain" OR MM "Anxiety" OR MM "Behavior"	88 948
#9	#1 OR #5	973 825
#10	#2 OR #6	487 506
#11	#3 OR #7	426 076
#12	#4 OR #8	577 904
#13	#9 AND #10 AND #11 AND #12	754
#14	Filters: Limited to from 2007/01/01	564
#15	Languages: English, Spanish and Portuguese	525

Cochrane Central Register of Controlled Trials (via EBSCOhost)

Search conducted on 13 April 2021.

Search	Query	Records retrieved
#1	TI (adolescen* OR teen* OR youth OR child* OR paediatric* OR pediatric* OR parent* OR mother* OR father* OR "early adulthood" OR "young adulthood" OR Family OR Caregiver* OR Care-giver OR Carer*) OR AB (adolescen* OR teen* OR youth OR child* OR paediatric* OR pediatric* OR parent* OR mother* OR father* OR "early adulthood" OR "young adulthood" OR Family OR Caregiver* OR Care-giver OR Carer*)	227 285
#2	TI (Surg* OR "pre-operative" OR Pre-operative OR Perioperative OR post-operative) OR AB (Surg* OR "pre-operative" OR Pre-operative OR Perioperative OR post-operative)	255 490
#3	TI ("audiovisual aids" OR book* OR multimedia* OR hypermedia OR pamphlet* OR education OR "teaching session" OR DVD OR "digital versatile disc" OR video* OR leaflet* OR "non-pharmacological intervention" OR "nonpharmacological intervention" OR "Complementary Therapy" OR "family centered care" OR "family centred care") OR AB ("audiovisual aids" OR book* OR multimedia* OR hypermedia OR pamphlet* OR education OR "teaching session" OR DVD OR "digital versatile disc" OR video* OR leaflet* OR "non-pharmacological intervention" OR "nonpharmacological intervention" OR "Complementary Therapy" OR "family centered care" OR "family centred care")	78 290
#4	TI (pain* OR anxiety OR behaviour OR behavior OR STAI OR "FLACC" OR "visual analog scale") OR AB (pain* OR anxiety OR behaviour OR behavior OR STAI OR "FLACC" OR "visual analog scale")	274 223
#5	MH "Adolescent" OR "Minors" OR "Child" OR "Child, Preschool" OR "Family" OR "Parents" OR "Mothers" OR "Fathers" OR "Caregivers"	131 505
#6	MH "Elective Surgical Procedures" OR "Surgical Procedures, Operative" OR "pre-operative care" OR "perioperative care" OR "post-operative care"	6 975
#7	MH "Hypermedia" OR "Education" OR "Teaching" OR "Teaching Materials" OR "Audiovisual Aids" OR "Multimedia" OR "Videotape Recording" OR "Books" OR "Pamphlets" OR "Complementary Therapies"	3 541
#8	MH "Pain" OR "Pain, Post-operative" OR "Anxiety" OR "Acute Pain" OR "Behavior"	5 416
#9	#1 OR #5	308 919
#10	#2 OR #6	256 539
#11	#3 OR #7	79 763
#12	#4 OR #8	275 234
#13	#9 AND #10 AND #11 AND #12	642
#14	Filters: Limited to from 2007/01/01	549
#15	Languages: English, Spanish and Portuguese	249

PsycINFO (via EBSCOhost)

Search conducted on 13 April 2021.

Search	Query	Records retrieved
#1	TI (adolescen* OR teen* OR youth OR child* OR paediatric* OR pediatric* OR parent* OR mother* OR father* OR "early adulthood" OR "young adulthood" OR Family OR Caregiver* OR Care-giver OR Carer*) OR AB (adolescen* OR teen* OR youth OR child* OR paediatric* OR pediatric* OR parent* OR mother* OR father* OR "early adulthood" OR "young adulthood" OR Family OR Caregiver* OR Care-giver OR Carer*)	1212659
#2	TI (Surg* OR "pre-operative" OR Pre-operative OR Perioperative OR post-operative) OR AB (Surg* OR "pre-operative" OR Pre-operative OR Perioperative OR post-operative)	53770
#3	TI ("audiovisual aids" OR book* OR multimedia* OR hypermedia OR pamphlet* OR education OR "teaching session" OR DVD OR "digital versatile disc" OR video* OR leaflet* OR "non-pharmacological intervention" OR "nonpharmacological intervention" OR "Complementary Therapy" OR "family centered care" OR "family centred care") OR AB ("audiovisual aids" OR book* OR multimedia* OR hypermedia OR pamphlet* OR education OR "teaching session" OR DVD OR "digital versatile disc" OR video* OR leaflet* OR "non-pharmacological intervention" OR "nonpharmacological intervention" OR "Complementary Therapy" OR "family centered care" OR "family centred care")	612500
#4	TI (pain* OR anxiety OR behaviour OR behavior OR STAI OR "FLACC" OR "visual analog scale") OR AB (pain* OR anxiety OR behaviour OR behavior OR STAI OR "FLACC" OR "visual analog scale")	1002197
#5	MA "Adolescent" OR "Minors" OR "Child" OR "Child, Preschool" OR "Family" OR "Parents" OR "Mothers" OR "Fathers" OR "Caregivers"	416167
#6	MA "Elective Surgical Procedures" OR "Surgical Procedures, Operative" OR "pre-operative care" OR "perioperative care" OR "post-operative care"	1944
#7	MA "Hypermedia" OR "Education" OR "Teaching" OR "Teaching Materials" OR "Audiovisual Aids" OR "Multimedia" OR "Videotape Recording" OR "Books" OR "Pamphlets" OR "Complementary Therapies"	62902
#8	MA "Pain" OR "Pain, Post-operative" OR "Anxiety" OR "Acute Pain" OR "Behavior"	309216
#9	#1 OR #5	1376746
#10	#2 OR #6	54103
#11	#3 OR #7	649702
#12	#4 OR #8	1137403
#13	#9 AND #10 AND #11 AND #12	570
#14	Filters: Limited to from 2007/01/01	344
#15	Languages: English, Spanish and Portuguese	333

SciELO

Search conducted on 9 April 2021.

Search	Query	Records retrieved
#1	(ti:(adolescen* OR teen* OR youth OR child* OR paediatric* OR pediatric* OR parent* OR mother* OR father* OR "early adulthood" OR "young adulthood")) OR (ab:(adolescen* OR teen* OR youth OR child* OR paediatric* OR pediatric* OR parent* OR mother* OR father* OR "early adulthood" OR "young adulthood"))	1307
#2	(ti:(Surgery OR "pre-operative preparation" OR "pre-operative preparation" OR surgical)) OR (ab:(Surgery OR "pre-operative preparation" OR "pre-operative preparation" OR surgical))	36 133
#3	(ti:(("audiovisual aids" OR book* OR multimedia* OR pamphlet* OR education OR "teaching session" OR DVD OR video* OR leaflet* OR "non-pharmacological intervention" OR "nonpharmacological intervention" OR "Complementary Therapy" OR "family centered care")) OR (ab:(("audiovisual aids" OR book* OR multimedia* OR pamphlet* OR education OR "teaching session" OR DVD OR video* OR leaflet* OR "non-pharmacological intervention" OR "nonpharmacological intervention" OR "Complementary Therapy" OR "family centered care"))	842
#4	(ti:(pain* OR anxiety OR behaviours OR behavior)) OR (ab:(pain* OR anxiety OR behaviours OR behavior))	54 029
#6	#1 AND #2 AND #3 AND #4	0
#7	Filters: Limited to from 2007/01/01 Languages: English, Spanish and Portuguese	0

* As no results were found for this search (at the time, the database was having problems), the authors tried a simpler search strategy.

SciELO

Search conducted on 15 April 2021.

Search	Query	Records retrieved
#1	(child* AND educat* AND anxiety)	117
#7	Filters: Limited to from 2007/01/01 Languages: English, Spanish and Portuguese	102

OpenGrey

Search conducted on 3 April 2021.

Search	Query	Records retrieved
#1	Intervention child surgery	1
#2	Filters: Limited to from 2007/01/01 Languages: English, Spanish and Portuguese	1

Open Access Theses and Dissertations

Search conducted on 3 April 2021.

Search	Query	Records retrieved
#1	intervention AND child AND surgery	58
#2	Filters: Limited to from 2007/01/01 Languages: English, Spanish and Portuguese	32

Repositório Científico de Acesso Aberto em Portugal (RCAAP)

Search conducted on 9 April 2021.

Search	Query	Records retrieved
#1	Família AND criança AND ansiedade (field: discussion)	177
#2	Filters: Limited to from 2007/01/01 Languages: English, Spanish and Portuguese	155

Effectiveness of family-centred educational interventions for anxiety, pain and behaviours of children and adolescents and anxiety of their parents during the perioperative journey: A systematic review and meta-analysis

Supplement 2: Studies ineligible following full-text review

Study	Reason for exclusion
1. Adams HA. A perioperative education program for paediatric patients and their parents. <i>AORN J.</i> 2011;93(4):472–81.	Ineligible study design (literature review)
2. Akinci SB, Köse EA, Ocal T, Aypar U. The effects of maternal presence during anesthesia induction on the mother's anxiety and changes in children's behavior. <i>Turk J Pediatr.</i> 2008;50(6):566–71.	Ineligible intervention
3. Álvarez GN, Gómez PV, Siles HA, Gracia RJ. Psychoprophylaxis in elective paediatric general surgery: Do audiovisual tools improve perioperative anxiety in children and their families? <i>Cir Pediatr.</i> 2017;30(4):216–20.	Ineligible study design, intervention and outcomes only for children
4. Arnon Z, Hanan H, Mogilner J. The effect of a hypnotic-based animated video on stress and pain reduction in pediatric surgery. <i>Int J Clin Exp Hypn.</i> 2018;66(2):123–33.	Intervention and outcomes only for children
5. Baghele A, Dave N, Dias R, Shah H. Effect of pre-operative education on anxiety in children undergoing day-care surgery. <i>Indian J Anaesth.</i> 2019;63(7):565–70.	Intervention and outcomes only for children
6. Bailey KM, Bird SJ, McGrath PJ, Chorney JE. Preparing parents to be present for their child's anesthesia induction: A randomized controlled trial. <i>Anesth Analg.</i> 2015;121(4):1001–10.	Ineligible intervention
7. Berghmans J, Weber F, van Akoleyen C, Utens E, Adriaenssens P, Klein J et al. Audiovisual aid viewing immediately before pediatric induction moderates the accompanying parents' anxiety. <i>Paediatr Anaesth.</i> 2012;22(4):386–92.	Ineligible population. Dr JB was contacted by email (31.7% of the study sample were under three years old)
8. Book F, Goedeke J, Poplawski A, Muensterer OJ. Access to an online video enhances the consent process, increases knowledge and decreases anxiety of caregivers with children scheduled for inguinal hernia repair: A randomized controlled study. <i>J Pediatr Surg.</i> 2020;55(1):18–28.	Ineligible intervention
9. Chorney JM, Kain ZN. Behavioral analysis of children's response to induction of anesthesia. <i>Anesth Analg.</i> 2009;109(5):1434–40.	Ineligible intervention, study design
10. Chorney JM, Tan ET, Kain ZN. Adult-child interactions in the postanesthesia care unit: behavior matters. <i>Anesthesiology.</i> 2013;118(4):834–41.	Ineligible intervention
11. Crandall M, Lammers C, Senders C, Braun JV, Savedra M. Children's pre-operative tonsillectomy pain education: Clinical outcomes. <i>Int J Pediatr Otorhinolaryngol.</i> 2008;72(10):1523–33.	Intervention and outcomes only for children
12. Dalley JS, McMurtry CM. Teddy and I get a check-up: A pilot educational intervention teaching children coping strategies for managing procedure-related pain and fear. <i>Pain Res Manag.</i> 2016;2016(0):4383967.	Intervention and outcomes only for children
13. De Armendi A, Gillaspay S, Shukry M, Martinez M, Cure J. Spanish video in anesthesia as an uncertainty and anxiety reducer tool in Spanish speaking parents. <i>Br J Anaesth.</i> 2012;108:ii286-ii7.	Abstract only

Study	Reason for exclusion
14. Eijlers R, Legerstee JS, Dierckx B, Staals LM, Berghmans J, van der Schroeffer MP et al. Development of a virtual reality exposure tool as psychological preparation for elective pediatric day care surgery: methodological approach for a randomized controlled trial. <i>JMIR Res Protoc</i> . 2017;6(9):e174.	Ineligible study design (protocol)
15. Festini F, Liguori S, Stacchini M, Ciofi D, Giusti F, Olivini N et al. Effectiveness of a new method to reduce pre-operative anxiety in children: Randomised controlled trial. <i>Arch Disease Child</i> . 2014;99(0):A79.	Abstract only
16. Fincher W, Shaw J, Ramelet A-S. Pre-operative preparation can ease children's and parents' anxieties. <i>Nurs Child Young People</i> . 2012;24(4):11.	Abstract only
17. Fortier MA, Blount RL, Wang SM, Mayes LC, Kain ZN. Analysing a family-centred pre-operative intervention programme: A dismantling approach. <i>Br J Anaesth</i> . 2011;106(5):713-8.	Ineligible study design
18. Fortier MA, Bunzli E, Walthall J, Olshansky E, Saadat H, Santistevan R et al. Web-based tailored intervention for preparation of parents and children for outpatient surgery (WebTIPS): Formative evaluation and randomized controlled trial. <i>Anesth Analg</i> . 2015;120(4):915-22.	Ineligible population. Dr MF was contacted by email. Did not receive a response regarding the study sample under three years old until the 26 July 2021, the date when the authors started the findings review.
19. Hamza Taha SM, Hassan El-Sayed RE. Effect of an educational comic story about pre-operative orientation on information and anxiety level of children undergoing surgery. <i>Clin Nurs Res</i> . 2021;30(6):771-779.	Intervention and outcomes only for children
20. Hee H, Lim E, Tan Q, Bao Z, Loh K, Hee HI et al. Effect of pre-operative education on behaviour of children during induction of anaesthesia: A randomised clinical trial of efficacy. <i>Anaesth Intensive Care</i> . 2012;40(5):795-802.	Intervention and outcomes only for children
21. Helgadóttir HL, Wilson ME. A randomized controlled trial of the effectiveness of educating parents about distraction to decrease post-operative pain in children at home after tonsillectomy. <i>Pain Manag Nurs</i> . 2014;15(3):632-40.	Ineligible intervention
22. Hilly J, Hörlin AL, Kinderf J, Ghez C, Menrath S, Delivet H, et al. Pre-operative preparation workshop reduces post-operative maladaptive behavior in children. <i>Paediatr Anaesth</i> . 2015;25(10):990-8.	Ineligible study design
23. Jang O. Efficacy of two screen-based approaches to relieving pre-operative anxiety in young children: preliminary data. Boston: Boston University; 2017.	Ineligible intervention
24. Jang O, Rodriguez S, Caruso T, Hernandez M, Simons L. A bed-mounted screen-based approach to managing pre-operative anxiety in young children undergoing mask induction of anesthesia. <i>J Pain</i> . 2017;18(Suppl 1):S42-S.	Abstract only
25. Ji L, Zhang X, Fan H, Han M, Yang H, Tang L et al. drawMD APP-aided pre-operative anesthesia education reduce parents' anxiety and improve satisfaction. <i>Patient Educ Couns</i> . 2016;99(2):265-70.	Methodology lacked rigour. Allocation to treatment groups unclear, treatment delivery blind to treatment assignment unclear, outcomes assessors were not blind to treatment allocation, unclear the appropriate statistical analysis used.
26. Jin Y, Jiang A, Jiang W, Wu W, Ye L, Kong X, et al. Self-produced audio-visual animation introduction alleviates pre-operative anxiety in pediatric strabismus surgery: a randomized controlled study. <i>BMC Ophthalmol</i> . 2021;21(1):163.	Ineligible intervention
27. Kain ZN, Caldwell-Andrews A, Mayes L, Weinberg M, Wang S-M, MacLaren J et al. Family-centered preparation for surgery improves perioperative outcomes in children. <i>Anesthesiology</i> . 2007;106(1):65-74.	Ineligible population
28. Kain ZN, Fortier MA, Chorney JM, Mayes L. Web-based tailored intervention for preparation of parents and children for outpatient surgery (WebTIPS): development. <i>Anesth Analg</i> . 2015;120(4):905-14.	Ineligible study design

Study	Reason for exclusion
29. Kerimoglu B, Neuman A, Paul J, Stefanov DG, Twersky R. Anesthesia induction using video glasses as a distraction tool for the management of pre-operative anxiety in children. <i>Anesth Analg</i> . 2013;117(6):1373–9.	Ineligible intervention
30. Khan S, Tumin D, King A, Rice J, Jatana KR, Tobias JD et al. Utilization of a post-operative adenotonsillectomy teaching video: A pilot study. <i>Int J Pediatr Otorhinolaryngol</i> . 2017;102:76–9.	Intervention and outcomes only for parents
31. Landier M, Villemagne T, Le Touze A, Braïk K, Meignan P, Cook AR et al. The position of a written document in pre-operative information for pediatric surgery: A randomized controlled trial on parental anxiety, knowledge, and satisfaction. <i>J Pediatr Surg</i> . 2018;53(3):375–80.	Intervention and outcomes only for parents
32. Lee J, Lee J, Lim H, Son JS, Lee JR, Kim DC et al. Cartoon distraction alleviates anxiety in children during induction of anesthesia. <i>Anesth Analg</i> . 2012;115(5):1168–73.	Ineligible intervention
33. Lerwick J. The impact of child-centered play therapy on anxiety levels in pre-neurosurgical pediatric patients. Oregon: Oregon State University; 2011.	Ineligible intervention
34. Li HC, Lopez V. Effectiveness and appropriateness of therapeutic play intervention in preparing children for surgery: A randomized controlled trial study. <i>J Spec Pediatr Nurs</i> . 2008;13(2):63–73.	Duplicate study sample
35. Li HC, Lopez V, Lee TL. Psychoeducational preparation of children for surgery: The importance of parental involvement. <i>Patient Educ Couns</i> . 2007;65(1):34–41.	Duplicate study sample
36. Li HCW. Evaluating the effectiveness of pre-operative interventions: The appropriateness of using the Children's Emotional Manifestation Scale. <i>J Clin Nurs</i> . 2007;16(10):1919–26.	Intervention and outcomes only for children
37. Liu CY, Xu L, Zang YL. Effectiveness of audiovisual interventions on stress responses in adolescents with ENT surgery in hospital: Randomized controlled trial protocol. <i>J Adv Nurs</i> . 2014;70(6):1414–24.	Ineligible study design (protocol)
38. Macindo JR, Macabuag KR, Macadangdang CM, Macaranas MV, Macarilay MJ, Madriñan NN et al. 3-D storybook: Effects on surgical knowledge and anxiety among four- to six-year-old surgical patients. <i>AORN J</i> . 2015;102(1):62.e1–10.	Intervention and outcomes only for children
39. Martin SR, Chorney JM, Tan ET, Fortier MA, Blount RL, Wald SH et al. Changing healthcare providers' behavior during pediatric inductions with an empirically based intervention. <i>Anesthesiology</i> . 2011;115(1):18–27.	Ineligible intervention
40. Nair T, Choo CSC, Abdullah NS, Lee S, Teo LLE, Chen Y, et al. Home-Initiated-Programme-to-Prepare-for-Operation: evaluating the effect of an animation video on perioperative anxiety in children: a randomised controlled trial. <i>Eur J Anaesthesiol</i> . 2021;38(8):880–7.	Intervention and outcomes only for children
41. Nilsson E, Svensson G, Frisman GH. Picture book support for preparing children ahead of and during day surgery. <i>Nurs Child Young People</i> . 2016;28(8):30–5.	Ineligible study design (descriptive intervention study).
42. Piper KN, Baxter KJ, Wetzell M, McCracken C, Travers C, Slater B et al. Provider education decreases opioid prescribing after pediatric umbilical hernia repair. <i>J Pediatr Surg</i> . 2020;55(7):1319–23.	Ineligible population
43. Rehman J, Rempel G, Williams E, Meakins L, Bauman M, Massicotte P et al. Development and evaluation of a pre-operative preparation program for parents of children undergoing fontan surgery. <i>Can J Cardiol</i> . 2020;36(10):S26.	Abstract only
44. Sakizci Uyar B, Polat R, Bolat M, Donmez A. Which is good for pre-operative anxiety? Midazolam, video games or teaching with cartoons: A randomised trial. <i>Eur J Anaesthesiol</i> . 2021;38(7):744–50.	Intervention and outcomes only for children
45. Sekhavatpour Z, Khanjani N, Reyhani T, Ghaffari S, Dastoorpoor M. The effect of storytelling on anxiety and behavioral disorders in children undergoing surgery: A randomized controlled trial. <i>Health Med Ther</i> . 2019;10:61–8.	Intervention and outcomes only for children

Study	Reason for exclusion
46. Seyedhejazi M, Sharabiani BA, Davari A, Taghizadieh N. A comparison of pre-operative psychological preparation with midazolam premedication to reduce anxiety in children undergoing adenotonsillectomy. <i>Afr J Paediatr Surg.</i> 2020;17(1-2):10-4.	Intervention and outcomes only for children
47. Shaheen A, Nassar O, Khalaf I, Kridli SA, Jarrah S, Halasa S. The effectiveness of age-appropriate pre-operative information session on the anxiety level of school-age children undergoing elective surgery in Jordan. <i>Int J Nurs Pract.</i> 2018;24(3):e12634.	Intervention and outcomes only for children
48. Shoja M, Heshmati Nabavi F, Ramezani M, Saki A. Effect of a pre-operative preparation program on anxiety in school-age children undergoing surgery using a factorial design. <i>J Evid Based Healthc.</i> 2018;7(4):30-7.	Intervention and outcomes only for children
49. Teixeira EMD, de Figueiredo MCB. The child's pre-operative experience in a planned surgery. <i>Revista de Enfermagem Referência.</i> 2009(9):7-14.	Ineligible study design (qualitative study)
50. Tomaszek L, Cepuch G, Fenikowski D. Influence of pre-operative information support on anxiety, pain and satisfaction with post-operative analgesia in children and adolescents after thoracic surgery: A randomized double-blind study. <i>Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub.</i> 2019;163(2):172-8.	Ineligible intervention
51. Tunney AM. A study to assess the effectiveness of the provision of written material in the form of a storybook in lessening anxiety in children aged 5-11 years undergoing tonsillectomy and adenoidectomy. Ulster: University of Ulster; 2014.	Intervention and outcomes only for children
52. Tural Buyuk E, Bolişik B. An analysis of the anxiety levels of mothers who participate in education and therapeutic games about their children's surgeries. <i>J Perianesth Nurs.</i> 2018;33(3):290-5.	Intervention and outcomes only for mothers
53. Türk E, Güven A, Karaca F, Edirne Y, Karaca I. Using the parents' video camera for the follow-up of children who have undergone hypospadias surgery decreases hospital anxiety of children. <i>J Pediatr Surg.</i> 2013;48(11):2332-5.	Ineligible intervention
54. Verschueren S, van Aalst J, Bangels AM, Toelen J, Allegaert K, Buffel C et al. Development of CliniPup, a serious game aimed at reducing perioperative anxiety and pain in children: Mixed methods study. <i>JMIR Serious Games.</i> 2019;7(2):e12429.	Ineligible study design
55. Volpato Broering C, Duarte de Souza C, Kaszubowski E, Aparecida Crepaldi M. Efeitos de Preparações Psicológicas Pré-Cirúrgicas sobre o Estresse e a Ansiedade de Meninos e Meninas [Effects of pre-surgical psychological preparations on stress and anxiety in boys and girls]. <i>Acta Colom de Psicol.</i> 2018;21(1):228-38.	Intervention and outcomes only for children
56. West N, Christopher N, Stratton K, Görges M, Brown Z. Reducing pre-operative anxiety with Child Life preparation prior to intravenous induction of anaesthesia: A randomized controlled trial. <i>Paediatr Anaesth.</i> 2020;30(2):168-80.	Intervention and outcomes only for children
57. Zhang QL, Xu N, Huang ST, Cao H, Chen Q. WeChat-assisted pre-operative health education improves the quality of life of parents of children with ventricular septal defects: A prospective randomised controlled study. <i>J Paediatr Child Health.</i> 2021;57(5):664-9.	Intervention and outcomes only for parents

Effectiveness of family-centred educational interventions for anxiety, pain and behaviours of children and adolescents and anxiety of their parents during the perioperative journey: A systematic review and meta-analysis

Supplement 3: Characteristics of included studies

Author (year) Location Setting	Study design	Participants age range in years (Mean)	Intervention Sample size (n) (time of intervention)	Comparator/ control Sample size (n)	Summary of intervention effect based on authors' results (measure used)			
					Child and adolescent outcomes			Parental outcomes
					Pain	Anxiety	Behaviour	Anxiety
Aydin & Uyar (2021) ⁵¹ Turkey Hospital	RCT	children 6–8 (6) mothers	Informative story book <i>Elif is being operated on</i> which gives details about pre-operative preparation such as admission to hospital, fasting before surgery, putting on surgical suits before surgery and going to the operating theatre. Books were either read by literate children or the mother of illiterate children. (ni=60; nf=51) Child F:M ratio (n) (25:26) Time: Read at least once before the surgery (not specified when).	Standard pre-operative care and a non-medical colourful story book appropriate for their age. (ni=60; nf=51) Child F:M ratio (n) (24:27)	Not assessed	Anxiety scores lower in EG than in CG at T0 (holding area) and T1 (while entering the operating room) (T0 – EG M=36.14; SD=11.7 vs CG M=40.38; SD=11.2; p=0.03 and T1 EG M=27.16; SD=5.5 vs CG M=29.67; SD=5.8; p=0.022, respectively). Also, those who read the intervention book more than three times had lower anxiety scores than those who read two times or less (p<0.001). (m-YPAS, observed)	Not assessed	No significant differences between groups in terms of mothers' anxiety on the day of surgery (EG M=41.06; SD=8.1 vs CG: M=38.41; SD=9.3; p=0.11). (STAI, self-reported)
Bartik & Toruner (2018) ⁵⁰ Turkey Hospital (interview room)	Quasi-experimental	children 7–12 (7–8) caregivers	Pre-operative program which included: <ul style="list-style-type: none"> • a booklet <i>The Care of Your Child in Outpatient Surgery</i> (how children feel about the procedure, how to prepare a child for surgery, what to bring to hospital, admission process, monitoring a child after surgery, post-operative nutrition and mobilisation, home care), verbal information and telephone counselling for parents • <i>The Colouring Book</i> (colouring pictures, puzzles and games with information for children about pre- and post-operative procedures) • information about the surgical process for children – gown, hat and purpose of wristbands – using a medical play doll. (ni=36; nf=36) Child F:M ratio (n) (4:32) Time: Day before surgery	Standard pre-operative care (ni=37; nf=37) Child F:M ratio (n) (4:33)	Not assessed	Not assessed	Not assessed	Reduced pre-operative anxiety in EG, with significant difference between groups (EG M=48.08; SD=9.52 vs CG M=53.59; SD=3.94, p=0.01). Reduced post-operative anxiety, with significant difference between groups (EG M=38.27; SD=8.93 vs CG M=53.81; SD=6.92, p=0.001). (STAI, self-reported)

Author (year) Location Setting	Study design	Participants age range in years (Mean)	Intervention Sample size (n) (time of intervention)	Comparator/ control Sample size (n)	Summary of intervention effect based on authors' results (measure used)			
					Child and adolescent outcomes			Parental outcomes
					Pain	Anxiety	Behaviour	Anxiety
Batuman et al. (2015) ³² Turkey Hospital	RCT	children 5–12 (7–8) parents	Information video regarding the perioperative period (fasting requirement, anaesthetic techniques and equipment used). Two scenes were created with a child, nurses, doctors and parents. (ni=21; nf=21) Time: On the day of surgery.	Standard pre-operative care (verbal information) (ni=21; nf=21)	Not assessed	Operating room at induction of anaesthesia: Anxiety scores were lower in EG than in CG (EG M=27.8; SD=7.8 vs CG M=78.9; SD=12.9; p=0.001). (m-YPAS, observed)	One week post-operatively: • difficulty getting to sleep (EG n=0 vs CG n=11) • nocturnal enuresis (EG n=0 vs CG n=5) • fear of dark (EG n=0 vs CG n=4) • objection to going to bed at night (EG n=0 vs CG = 10) • decreased appetite (EG n=0 vs CG n=12), p<0.05. Children with high anxiety levels at induction had higher ratios of difficulty getting to sleep, objection to going to bed at night, crying or being upset when left alone for a few minutes, temper tantrums, fear of dark, decreased appetite, refusal to comply with parents (r=0.65 p=0.001; r=0.56, p=0.001; r=0.37, p=0.02; p=0.02, r=0.35; p=0.04, r=0.31; p=0.001, r=0.52; p=0.03, r=0.34; respectively). (PHBQ, reported by parents)	Not assessed
Chartrand et al. (2017) ³⁴ Canada Hospital	RCT	children 3–10 (5.3) parents	DVD <i>You and your child in the RR</i> designed to provide parents with knowledge about the equipment and procedures in the RR, roles of health care professionals and potential reaction of children waking up after general anaesthesia. (ni=59; nf=49) Child F:M ratio (n) (22:27) Parent F:M ratio (n) (38:11) Time: not detailed.	Standard pre-operative care (ni=64; nf=56) Child F:M ratio (n) (19:37) Parent F:M ratio (n) (47:9)	No significant difference between groups at the RR (EG M=1.51; SD=1.89 vs CG M=2.06; SD=2.36; p=0.27). Significantly reduced pain in EG in the day care surgery unit (EG M=0.49; SD=0.84 vs CG M=1.16; SD=1.59; p=0.02). (mCHEOPS, observed by assessor)	Not assessed	Post-operative distress is defined as facial, verbal and affective manifestations and motor indicators of emotional distress related to anxiety, anger, fear and pain. No significant difference between groups regarding children's distress (EG M=26.73; SD=19.19 vs CG M=23.34; SD=17.51; p=0.59). (EDCEO, which includes six items)	T1 (immediately before entering the RR), T2 (5 minutes after entering the RR), T3 (5 minutes after leaving the RR with their child). No significant difference between groups in parents' anxiety at T1, T2 or T3. At T1: EG M=3.32; SD=2.50 vs CG M=3.51; SD=2.43; t=0.68, p=0.66. At T2: EG M=2.76; SD=2.60 vs CG M=2.73; SD=2.44, t=0.68, p=0.66. At T3: EG M=0.68; SD=1.71 vs CG M=1.31; SD=2.01, t=0.68, p=0.66. (VAS, self-reported)
Coskunturk & Gozen (2017) ³⁵ Turkey Hospital	RCT	children 6–12 (8–9) mothers	Pre-operative program 'ITPEP' that included: • educational booklet • therapeutic play • a short visit to PACU. (ni=23; nf=23) Child F:M ratio (n) (13:10) Time: Day before surgery.	Standard pre-operative care (conventional mode of education) (ni=20; nf=20) Child F:M ratio (n) (11:9)	Not assessed	No significant difference between groups on the day before surgery (EG M=40.90; SD=7.20 vs CG M=39.40; SD=6.72; p=0.48). Significantly reduced levels in the experimental group six hours post-operatively (EG M=27.40; SD=5.03 vs CG M=43.80; SD=4.55, p=0.01). (STAI-C, self-reported)	Not assessed	No significant difference in pre-operative parental anxiety (day before surgery) between groups (EG M=34.20; SD=11.10 vs CG M=31.70; SD=9.70; p=0.43). Significant difference in post-operative parental anxiety (six hours post-operatively) between groups (EG M=16.30; SD=7.30 vs CG M=39.00; SD=8.90; p=0.01). (BAI, self-reported)
Cumino et al. (2013) ³⁶ Brasil Hospital	RCT	children 4–8 (5–6) parents	Leaflet for parents containing information about the anaesthetic procedure (ni=36; nf=36) Child F:M ratio (n) (17:19) Time: After pre-anaesthetic assessment	Standard pre-operative care (verbal information) (ni=36; nf=36) Child F:M ratio (n) (10:26)	Not assessed	No significant difference between groups in the surgical centre waiting room (WR) and operating room (OR) before induction of anaesthesia (WR: EG Mdn=25.00[23.40-30.00] vs CG Mdn=26.70 [24.30-38.40] p=0.45; OR: EG Mdn=40.80[33.40-57.60] vs CG Mdn=44.2[25.9-56.7] p=0.68). (m-YPAS, observed)	Not assessed	No significant difference between groups pre-operatively (EG Mdn=9.00 [3.25-17.50] vs CG Mdn=8.00 [5.25-16.00], p=0.84). (HAM-A, self-reported)

Author (year) Location Setting	Study design	Participants age range in years (Mean)	Intervention Sample size (n) (time of intervention)	Comparator/ control Sample size (n)	Summary of intervention effect based on authors' results (measure used)			
					Child and adolescent outcomes			Parental outcomes
					Pain	Anxiety	Behaviour	Anxiety
Cumino et al. (2017) ⁹³ Brasil Hospital	RCT	children 4–8 (5–6) parents	Informed group that received a leaflet containing information about the anaesthetic procedure. (ni=21; nf=21) Child F:M ratio (n) (7:14) Parent F:M ratio (n) (20:1) Time: Day before surgery.	Standard pre-operative care (only information). (ni=21; nf=21) Child F:M ratio (n) (7:14) Parent F:M ratio (n) (20:1)	Not assessed	No statistically significant differences between EG when compared to CG in the holding area (EG Mdn=23.40 [23.40-25.00], vs CG Mdn=23.40 [23.40-41.70], p=0.19). Statistically significant differences between EG and CG at induction of anaesthesia (EG Mdn=28.40[23.40-45.00] vs CG Mdn=55.00 [30.00-68.40], p=0.02). (m-YPAS, observed)	Not assessed	Not assessed
Eijlers et al. (2019) ⁹⁰ Netherlands Hospital	RCT	children 4–12 (9) parents	Virtual reality video environment modelled according to the real operating theatre and medical staff (two versions, one for children aged 4–7 and 8–12). (ni=100; nf=94) Child F:M ratio (n) (49:45) Time: Day of surgery.	Standard pre-operative care (ni=100; nf=97) Child F:M ratio (n) (41:56)	No differences in pain levels were found between EG and CG, whether self-reported with FPS-r in RR (EG 2.00 [0.00-4.00] vs CG 2.00 [0.00-2.50], p=0.70), nurse-observed with FLACC in RR (EG 0.00 vs CG 0.00, p=0.70) or parent-observed with PPPM at home (EG 3.00 [0.00-5.00] vs CG 3.00 [1.00-8.00], p=0.41). (FPS-r self-reported) (FLACC observed) (PPPM – parent observed)	No differences in anxiety levels were found between groups at different time points: T1 (hospital admission), T2 (holding area), T3 (induction of anaesthesia), T4 (RR), T5 (at home). mYPAS: • T2 EG Mdn=28.30 [23.30-36.70] vs CG Mdn=28.30 [23.30-41.70], p=0.77 • T3 EG Mdn=40.00 [28.30-58.30] vs CG Mdn=38.30 [28.30-53.30], p=0.86. VAS: • T2 EG Mdn=3.00 [0.10-5.50] vs CG Mdn=3.50[0.00-6.00], p=0.75. (m-YPAS, observed) (VAS, self-reported)	No differences were found in emergence delirium symptoms between groups at T4 (EG Mdn=7.00[5.00-8.00] vs CG Mdn=6.00[5.00-9.00], p=0.266). (PAED, observed)	No differences in pre-operative parental anxiety were found between groups, either when self-reported (STAI-state) (EG Mdn=41.00 [34.50-48.50] vs CG Mdn=40.5 [33.00-50.00], p=0.75), or when observed (VAS) (EG Mdn=3.00 [2.00-5.00] vs CG Mdn=3.50 [2.00-5.00], p=0.42). (STAI self-reported) (VAS observed)
Faramarzi et al. (2020) ⁹⁵ Iran Hospital	RCT	children 9–12 (10) parents	Usual care and an informative booklet plus multi-component preparation program including: • a DVD with adequate information through an educational tour of the pre-operative office, arrival at the surgical ward, equipment used in the operating room and post-operative recommendations • therapeutic play (demonstration of obtaining vital signs and equipment used). (ni=141; nf=121) Child F:M ratio (n) (68:53) Time: From two weeks until a few minutes before surgery.	Usual care and an informative booklet about the anatomy of tonsils, indications and complications of tonsillectomy, recommendations for the post-operative period. (ni=141; nf=120) Child F:M ratio (n) (59:61)	Pain scores in PACU and at four and eight hours post-operatively (4h and 8h) were not statistically significant between groups. • PACU EG M=1.35; SD=0.52 vs. CG M=1.21; SD=0.81; p=0.11 • 4h EG M=1.61; SD=0.47 vs. CG M=1.73; SD=0.84; p=0.17 • 8h EG M=2.29; SD=0.56 vs. CG M=2.33; SD=0.92; p=0.68. (VAS, observed)	Not assessed	Not assessed	Not assessed
Fernandes et al. (2014) ⁴ Portugal Hospital	RCT	children 8–12 (10) parents	Children received educational materials in the format of a board game, video or a booklet with information about surgery or hospitalisation (health care professionals, medical instruments, clinical procedures and induction of anaesthesia, changing of clothes, parental separation for surgery). (ni=45; nf=45) Child F:M ratio (n) (12:33) Parent F:M ratio (n) (40:5) Time: Day of surgery.	No material received, but the same information was given. (ni=35; nf=35) Child F:M ratio (n) (6:29) Parent F:M ratio (n) (30:5)	Not assessed	Not assessed	Not assessed	No statistically significant differences in parental anxiety between EG and CG (p=0.78, d=0.06). (STAI form Y, self-reported)

Author (year) Location Setting	Study design	Participants age range in years (Mean)	Intervention Sample size (n) (time of intervention)	Comparator/ control Sample size (n)	Summary of intervention effect based on authors' results (measure used)			
					Child and adolescent outcomes			Parental outcomes
					Pain	Anxiety	Behaviour	Anxiety
Fernandes et al. (2015) ⁶⁵ Portugal Hospital	RCT	children 8–12 (9) parents Child F:M ratio (n) 21:69 Parent F:M ratio (n) 78:12	Multimedia application/game 'An Adventure at the Hospital' divided into different levels to illustrate hospital procedures and perioperative stages (from admission to aftercare). (ni=30; nf=30) Time: Day of surgery	Standard pre-operative care / no intervention (ni=30; nf=30)	Not assessed	Not assessed	Not assessed	Pre-operative parental anxiety was lower in EG (EG M=1.89; SD=0.54) than CG (CG M=2.19; SD=0.60; p=0.033). (STAI form Y (0-4), self-reported)
Fincher et al. (2012) ⁶⁶ Australia Hospital	RCT	children 3–12 (6) parents	Pre-operative preparation program including: <ul style="list-style-type: none"> • a photo file with the sequence of events that occur when a child is going to theatre • demonstration of equipment using peer modelling approach • a tour of pre-operative bay and PACU. This program was tailored according to the child's age. Older children received more specific explanations. (ni=37; nf=35) Child F:M ratio (n) (16:19) Time: One or two days before surgery for children aged 3–5 and five to ten days for children aged 6 and older.	Standard pre-operative care (ni=36; nf=32) Child F:M ratio (n) (18:14)	PACU, arrival at ward from PACU, 24 hours and two weeks post-operatively. (Time for the results not detailed.) The pain score in EG was significantly lower than in CG. EG Mdn=2.00 [IQR 5.00] vs CG Mdn=4.00 [IQR 4.00], p=0.001). (FLACC if children aged <5; FPS-r if 5, observed)	Baseline, admission to ward, holding area, anaesthetic room, induction, PACU, arrival at ward from PACU, 24 hours and two weeks post-operatively. No significant difference between groups in pre-operative anxiety (-0.59; 95% CI [-1.23 to 0.06], p=0.07). Decreasing anxiety post-operatively regardless of group allocation. (m-YPAS, observed)	Two weeks post-operatively. Majority of children (47.9%) experienced negative behavioural changes two weeks post-operatively with a total score > 81. No significant difference in post-operative behaviour between groups (EG M=83.66; SD=5.41 vs CG M=83.40; SD=11.86; p>0.05). (PHBQ, assessed by the parents)	Baseline, admission to ward, holding area. Significant difference in anxiety between groups (-2.32 CI [-4.06 to -0.56], p=0.01). (STAI, self-reported)
Kassai et al. (2016) ⁶⁷ France Hospital	RCT	children 6–17 (12) parents	Comic information leaflet, with information regarding the surgical process and illustrations, in addition to verbal information. (ni=57; nf=54) Child F:M ratio (n) (29:25) Time: Few days before hospitalisation	Standard pre-operative care (verbal information) (ni=58; nf=57) Child F:M ratio (n) (30:27)	Not assessed	Anxiety scores lower in EG than in CG (EG 32.09 (baseline) to 30.07 (pre-op); CG 30.40 (baseline) to 31.30 (pre-op); estimate=-2.90, SE=0.90, t=-3.21, p=0.002) (STAI-C-S, self-reported)	Not assessed	No significant differences between groups pre-operatively (estimate=-0.03, SE=0.06, t=0.48, p=0.63). (STAI for children, self-reported)
Kumar et al. (2019) ⁶⁴ India Hospital	RCT	children 5–15 (8–9) parents	Preparation program, in which children and parents were shown images of the operating room, ICU and post-operative ward. A pamphlet was also given. Children were also allowed to play games and videos during their stay in the pre-operative ward. (ni=30; nf=28) Child F:M ratio (n) (7:21) Time: Day before surgery.	Standard pre-operative care (ni=30; nf=27) Child F:M ratio (n) (15:12)	Post-operative pain score significantly low (p<0.001) in EG (2.00[1.00-5.00]), compared to CG (4.00[2.00-7.00]). (The Wong-Baker scale, self-reported)	No significant differences between groups for pre-operative anxiety scores. (State pre-operative scores: EG M=45.70; SD=5.10 vs CG M=44.20; SD=5.30; p=0.29.) Post-operative anxiety scores significantly lower in EG than in CG (State post-operative scores: EG M=27.40; SD=2.90 vs CG M=39.70; SD=4.30; p<0.001). (STAI-C, self-reported)	Not assessed	No significant difference between groups in pre-operative state anxiety (EG M=63.00; SD=11.70 vs CG M=64.10; SD=7.50; p=0.69) and trait anxiety (EG M=53.50; SD=14.90 vs CG M=51.60; SD=9.20; p=0.58). Significantly lower post-operative state anxiety in EG than CG (EG M=42.00; SD=4.40 vs CG M=54.50; SD=7.80 p<0.001). There was no difference in post-operative trait anxiety between groups. (STAI, self-reported)

Author (year) Location Setting	Study design	Participants age range in years (Mean)	Intervention Sample size (n) (time of intervention)	Comparator/ control Sample size (n)	Summary of intervention effect based on authors' results (measure used)			
					Child and adolescent outcomes			Parental outcomes
					Pain	Anxiety	Behaviour	Anxiety
Li et al. (2007) ⁷¹ Hong Kong Hospital	RCT	children 7–12 (9) parents	Therapeutic play intervention for five children (and one of their parents) per group. (ni=126; nf=97) Child F:M ratio (n) (30:67) Time: One week before surgery.	Standard pre-operative care. (ni=122; nf=106) Child F:M ratio (n) (33:73)	No significant difference in mean post-operative pain scores for children in EG and CG (EG M=4.19; SD=1.18 vs CG M=4.47; SD=1.24; t [201] =1.68, p=0.09). (VAS, self-reported)	Assessed at three points: pre-intervention, post-intervention and post-surgery. Statistically significant main effect, suggesting that children in EG experienced lower anxiety scores than children in CG (F (1,201) =5.36, p<0.02, Partial η^2 =0.04). Children in EG reported lower anxiety scores than children in CG in both post-intervention and post-operation (post-intervention scores EG M=34.36; SD=8.09 vs CG M=38.60; SD=8.53; post-operation scores EG M=33.58; SD=5.90 vs CG M=36.16; SD=5.60). (Chinese version of CSAS-C, observed)	Statistically significant difference in mean CEMS for children in experimental and control groups (EG M=10.46; SD=3.79 vs CG M=13.63; SD=4.49; t [201] =5.40, p<0.001), with children receiving the intervention exhibiting fewer emotions at induction of anaesthesia. (CEMS, observed)	Not assessed
Liguori et al. (2016) ⁹⁹ Italy Hospital	RCT	children 6–11 (8–9) parents/ guardians	Six-minute video, in which two clown physicians take a tour of one of the operating theatres ('Clickamico' or 'Buddyclick'). Video integrated into an app for mobile devices. (ni=20; nf=20) Child F:M ratio (n) (11:9) Time: Afternoon before the surgical procedure.	Standard pre-operative care (ni=20; nf=20) Child F:M ratio (n) (9:11)	Not assessed	Significantly lower pre-operative anxiety in EG (EG M=33.00; SD=18.40 vs CG M=48.60; SD=15.90; p=0.01. (m-YPAS, observed)	Not assessed	Not assessed
Lin et al. (2019) ⁹⁰ Taiwan Hospital	RCT	children 3–12 (6) parents/ caregivers	Multi-component family-centred pre-operative preparation program including: • a tour of the pre-operative area and recovery room • four-minute cartoon video 'I am not afraid of surgery' • familiarisation with medical equipment. (ni=35; nf=32) Child F:M ratio (n) (9:23) Time: Days before surgery (not specified).	Standard pre-operative care (ni=35; nf=34) Child F:M ratio (n) (7:27)	Not assessed	Not assessed	T1 (baseline), T2 (holding area), T3 (induction of anaesthesia), T4 (RR). Pre-operative scores in EG were 3.4 points lower than those in CG at T3 vs T1 (estimated effect =-3.42, SE=1.23, p=0.01) and T2 vs T1 (estimate=-2.37, SE=1.25, p=0.06) (Linear Mixed-Effects Model). Behaviour score of the control group increased over time from T1 to T3 (7.87–12.23). (CEMS, observed) None of the children in EG had scores of 4 or 5 upon arrival in the RR, but two children in CG had scores of 4. Children's post-operative behaviour did not significantly differ between the two groups upon arrival or at 15 minutes (p=0.59, p=0.80, p=0.30, p=0.48, respectively; Fisher's exact test). (Post-op scoring system for emergence delirium, by Cole et al. (2002), observed). Two weeks after surgery, one child from EG experienced negative behaviours (waking up crying) whereas none of the children in CG exhibited negative behaviours. (Telephone follow-up, reported by parents).	The anxiety of the caregiver decreased over time, but there were no differences between groups and no interactions with time (T1–T3 EG 24.39–21.48 vs CG 24.98–22.13). (APAIS, self-reported)

Author (year) Location Setting	Study design	Participants age range in years (Mean)	Intervention Sample size (n) (time of intervention)	Comparator/ control Sample size (n)	Summary of intervention effect based on authors' results (measure used)			
					Child and adolescent outcomes			Parental outcomes
					Pain	Anxiety	Behaviour	Anxiety
Matthysens et al. (2020) ³ Belgium Hospital	RCT	children 5–11 (7) parents	CliniPup® (game that addresses pain management and what happens throughout the surgical process) and links to the e-learning module for parents and digital scoring tools. (ni=43; nf=25) Child F:M ratio (n) (8:17) Time: Seven days before surgery.	Standard pre-operative care. (ni=29; nf=25) Child F:M ratio (n) (9:16)	Pain score in EG was significantly lower than in CG at T1 (b=1.12, 95% CI from 2.10 to 0.14; p=0.03). No statistically significant difference between groups at T3 and T4 (p values not detailed). (VASp) (self-reported + assessed by parents)	T0 (one week pre-operatively), T1 (baseline, at home, after playing CliniPup®/ empty game), T2 (at hospital admission), T3 (hospital, post-operatively, before discharge), T4 (at home, one week post-operatively), T5 (one month post-operatively). Anxiety levels at T1 significantly lower in EG than CG (EG M=1.90 vs CG M=4.50, p=0.003). Anxiety Levels at T2 with no significant differences between groups (EG M=2.40 vs CG M=4.10, p=0.14). Anxiety and pain were significantly correlated in this study at T1, T2 and T4 (rsT1=0.26, p=0.04; rsT2=0.34, p=0.04; rsT4=0.51, p=0.00, respectively). (VASa) (0-4), self-reported and assessed by parents)	Measured at T5. No significant differences between groups (p=0.78) one month after surgery. (PHBQ-AS, reported by parents)	Measured at T2. No significant differences between groups pre-operatively (p=0.45, n=34). (STAI, self-reported)
Park et al. (2019) ⁵⁶ South Korea Hospital	RCT	children 4–10 (6–7) parents	Virtual reality tour video in which a little penguin introduces itself and explains details of the pre-operative preparation process to children. Parents watched the same video via mirroring display. (ni=40; nf=40) Child F:M ratio (n) (13:27) Time: One hour before surgery.	Children watched VR-guided tour of the operating theatre. (ni=40; nf=40) Child F:M ratio (n) (20:20)	Not assessed	Significant difference between groups pre-operatively (EG Mdn=28.30 [23.30-36.70] vs CG Mdn=38.30[23.30-44.20]; p=0.03). (m-YPAS Korean version, observed)	No statistical differences between groups for compliance at induction (EG n=30 of 40 vs CG n=26 of 40 perfect compliance; p=0.72). (ICC, observed)	Parents in EG showed less anxiety (after induction) than those in CG (EG Mdn=30.00[10.00-62.50] vs CG Mdn=55.00 [40.00-80.00], p=0.03). (101 Numeric Rating Scale, self-reported)
Ryu et al. (2017) ⁵⁵ Korea Hospital	RCT	children 4–10 (6) parents	Four-minute virtual reality video showing the operating theatre and explaining the perioperative process. (ni=35; nf=34) Child F:M ratio(n) (17:17) Time: One hour before surgery.	Standard pre-operative care. (ni=35; nf=35) Child F:M ratio (n) (11:24)	Not assessed	Anxiety scores lower in EG than in CG in the pre-operative holding area before entering the theatre (EG Mdn=31.70[23.30-37.90] vs CG Mdn=51.70 [28.30-63.30], p<0.001). (m-YPAS, observed)	Significant differences in compliance and distress between experimental and control groups. More children in EG showed perfect compliance (ICC score 0) (EG 28 of 34 vs CG 12 of 35, p<0.001). (ICC, observed) The score PBRS was significantly lower in the experimental group than in the control group (EG Mdn=0.00[0.00-1.00] vs. CG Mdn=1.00[0.00-4.00], p=0.01). (PBRS, observed)	Not assessed
Ryu et al. (2018) ⁵⁵ Korea Hospital	RCT	children 4–10 (5–6) parents	Five-minute virtual reality game where the player would be given the opportunity to interact and explore the operating theatre environment. (ni=35; nf=34) Child F:M ratio (n) (16:18) Time: One hour before surgery.	Standard pre-operative care (conventional mode of education) (ni=35; nf=35) Child F:M ratio (n) (13:22)	Not assessed	Pre-anaesthesia anxiety levels lower in EG than CG (EG Mdn=28.30 [23.30-36.70] vs CG Mdn=46.70 [31.70-51.70], p<0.001). (m-YPAS, observed)	No significant differences between groups (EG Mdn=0.00[0.00-1.00] vs CG Mdn=1.00[0.00-2.00], p=0.09). (PBRS) Better compliance in EG than in CG (p=0.038). (ICC, observed)	Not assessed

Author (year) Location Setting	Study design	Participants age range in years (Mean)	Intervention Sample size (n) (time of intervention)	Comparator/ control Sample size (n)	Summary of intervention effect based on authors' results (measure used)			
					Child and adolescent outcomes			Parental outcomes
					Pain	Anxiety	Behaviour	Anxiety
Ryu et al. (2019) ⁵⁷ Korea Hospital	RCT	children 4–10 (6) parents	Four-minute virtual reality video showing the operating theatre and explaining the perioperative process. (ni=43; nf=41) Child F:M ratio (n) (12:29) Time: One hour before surgery.	Standard pre-operative care (without intervention) (ni=43; nf=39) Child F:M ratio (n) (18:21)	Not assessed	Pre-operative anxiety levels lower in EG than CG at the induction of anaesthesia (EG Mdn=38.30 [23.30-50.90] vs CG Mdn=46.70 [33.30-63.30], p=0.02). (m-YPAS, observed by blinded assessor)	The incidence of emergence delirium was similar in the two groups (EG n=14 of 41 vs. CG n=16 of 39, p=0.77). PAED score between groups was similar without statistical significance (EG=8.00 [3.50-12.50] vs CG=8.00 [5.00-12.00], p=0.79). (PAED) Post-operative day 1: three children in EG reported behavioural disturbance vs two in CG. Post-operative day 14: one child in EG reported behavioural disturbance vs none in CG. No significant difference between the two groups on post-operative day 1 (p=0.671) and day 14 (p=0.329). (PHBQ for ambulatory surgery, recorded by calling the parents on day 1 and 14 after surgery)	Not assessed
Sabaq & El-Awady (2012) ⁵⁷ Egypt Hospital	Quasi-experimental	children 9–12 (10) mothers	Pre-operative program including: a pre-operative tour therapeutic play (a manikin demonstration and a return demonstration by the children) of pre-operative procedures. (ni=60; nf=60) Child F:M ratio (n) (34:26) Time: Day before surgery.	Standard pre-operative care (ni=60; nf=60) Child F:M ratio (n) (35:25)	Not assessed	Lower anxiety scores post-intervention in EG than in CG. STAI Mean scores: • EG M=36.63, SD=2.18 • CG M=44.80, SD=3.18 (p<0.001). Low anxiety levels (37): • EG n=45 of 60 • CG n=35 of 60. Moderate (38-44): • EG n=8 of 60 • CG n=15 of 60. High anxiety (37): • EG n=7 of 60 • CG n=10 of 60. (STAI, self-reported)	Compliance during induction of anaesthesia higher in EG than in CG (Compliance EG n=39 of 60 vs CG n=20 of 60, p=0.001; non-compliance EG n=21 of 60 vs. CG n=40 of 60, p=0.001). (ICC, observed) Children in EG had improved eating behaviour compared with children in CG (POD2 50.00% vs 33.30%; POD3 66.70% vs 41.70%; POD7 83.30% vs 66.70%, p=0.05). Children in CG had more problems falling asleep, staying asleep and waking up crying than children in EG (POD1 51.30% vs. 44.60%, p=0.05; POD2: 40.70% vs. 33.20%). (PHBQ, completed by mothers)	Mothers in EG had lower anxiety scores than those in CG. STAI Mean scores: • EG M=36.80, SD 2.19 • CG M=43.80, SD 3.17 (p=0.01). (STAI, self-reported)
Tabrizi et al. (2015) ⁶⁵ Iran Hospital	RCT	children 8–10 (9–10) parents	Pre-operative visits to children and parents were performed with a booklet and explanation provided by the anaesthesiologist. (ni=18; nf=18) Child F:M ratio (n) (8:10) Time: Day before surgery.	Standard pre-operative care (ni=15; nf=15) Child F:M ratio (n) (9:6)	Not assessed	Children who received training by the anaesthesiology residents (EG) had less anxiety on the morning of surgery than the ones in CG (EG M=30.8; SD=6.0 vs CG M=34.1; SD=6.7). However, the difference was not statistically significant (p=0.1). (STAIc, self-reported)	Not assessed	Anxiety reduced after reading the book. EG before reading the book M=41; SD=12.7 vs after reading the book M=35.6; SD=9.5; p=0.04. There was no significant difference in the mothers' anxiety levels between groups just before the operation (EG M=35.6; SD=9.5 vs CG M=42.8; SD=14; p=0.1). (STAI, self-reported)
Vaezzadeh et al. (2011) ⁵⁷ Iran Hospital	RCT	children 7–1 (9) mothers	Therapeutic play that included a group of structured activities, such as a pre-operative tour and a manikin demonstration, with a return demonstration by the children, of pre-operative procedures. (ni=61; nf=61) Child F:M ratio (n) (19:42) Time: Day before surgery.	Standard pre-operative care (ni=61; nf=61) Child F:M ratio (n) (18:43)	Not assessed	Children in EG reported significantly lower pre-operative anxiety scores in (EG M=31.44, SD=5.87 vs CG M=38.31, SD=7.44 post-intervention, respectively) (p=0.001) (SSAS-c, self-reported)	Not assessed	Not assessed

Author (year) Location Setting	Study design	Participants age range in years (Mean)	Intervention Sample size (n) (time of intervention)	Comparator/ control Sample size (n)	Summary of intervention effect based on authors' results (measure used)			
					Child and adolescent outcomes			Parental outcomes
					Pain	Anxiety	Behaviour	Anxiety
Wakimizu et al. (2009) ⁶⁶ Japan Hospital	RCT	children 3–6 (4–5) parents/ caregivers ni=158 nf=150 n (one month after surgery) = 144	Visualisation of the educational video 'Shujutsu ni ikou', that introduces the experience of a five-year-old boy who is hospitalised for inguinal hernia. The participants in this group could watch the video as many times they wished during the week before surgery. Auxiliary booklet for the video was given to caregivers. (ni=77; nf=74) Child F:M ratio (n) (28:49) Parent F:M ratio (n) (74:3) Time: The week before surgery.	Visualisation of the educational video 'Shujutsu ni ikou' once, one week before surgery. Auxiliary booklet for the video was given to caregivers. (ni=81; nf=76) Child F:M ratio (n) (31:50) Parent F:M ratio (n) (75:6)	Not assessed	Significant group differences and group-by-time interaction in the anxiety levels (F=3.78, p<0.05; F=2.81, p=0.04, respectively) (Wong-Baker FACES Rating Scale, self-reported)	Not assessed	Significant difference between groups over the study period (F=5.49, p=0.02). (STAI-S Japanese version, self-reported)
Yadav et al. (2020) ⁶⁵ India Hospital	RCT	children 6–12 (8)	15-minute video 'PES' (Pre-operative Educational Schedule) of a visit to the operating theatre explaining pre- and post-operative care and discussing common medication, types of anaesthesia and commonly used medical instruments that the child would see in a surgery. (ni=28; nf=28) Child F:M ratio (n) (7:21) Parent F:M ratio (n) (15:13) Time: Evening before surgery.	Standard pre-operative care (ni=28; nf=28) Child F:M ratio (n) (10:18) Parent F:M ratio (n) (10:18)	Not assessed	Post-intervention, pre-operative anxiety levels (day of surgery, in the morning) were significantly lower in EG than CG (EG Mdn=0.00[0.00-1.00] vs CG Mdn=4.00[2.00-6.70], p=0.00). Mean values: EG M=0.54; SD=1.07 vs CG: M=4.14; SD=2.39. (HAM-A, self-reported)	Not assessed	Significant reduction in anxiety levels in EG post-intervention (EG Mdn=8.50[2.00-19.00] vs CG Mdn=32.50[27.25-35.75]; p=0.00). (HAM-A, self-reported)
Zhu et al. (2018) ⁶⁰ Singapore Hospital	RCT	children 6–14 (9) parents	Post-operative pain management educational intervention program for parents including: • a booklet • a video • a one-hour face-to-face teaching session on pain management. (ni=54; nf=49) Child F:M ratio (n) (14:35) Parent F:M ratio (n) (42:7) Time: 3–7 days before surgery.	Standard pre-operative care. (ni=54; nf=51) Child F:M ratio (n) (21:30) Parent F:M ratio (n) (44:7)	No statistically significant differences in the highest pain scores at 24 hours after the surgery (EG M=6.62; SD=2.65 vs CG M=5.75; SD=2.73; F=1.22, p=0.30, partial $\eta^2=0.02$) and between 24 hours and two weeks after surgery among the three groups (EG M=4.67; SD=3.30 vs. CG M=4.60; SD=3.27; F=0.06, p=0.95, partial $\eta^2=0.001$). (Child's Pain Diary Form for parents with Numeric Rating Scale, parental report after being discharged.)	Not assessed	Not assessed	Not assessed

Abbreviations: CG = control group; EG = experimental group; ni = Initial participants number; nf = final/analysed participants number; Child F:M ratio = Ratio of female to male children; Parent F:M ratio = Ratio of female to male parents; M = mean; MD = mean difference; Mdn = median; SD = standard deviation; APAIS = Amsterdam Pre-operative Anxiety and Information Scale; BAI = Beck Anxiety Inventory; CEMS = Children's Emotional Manifestation Scale; CSAS-C = Chinese version of the State Anxiety Scale for Children; EDCEO = Échelle descriptive du comportement de l'enfant opéré; FLACC scale = Face, Legs, Activity, Cry, Consolability; FPS-r = Faces Pain Scale revised; ICC = Induction Compliance Checklist; HAM-A = Hamilton Anxiety Rating Scale; m-YPAS = The modified Yale Pre-operative Anxiety Scale; mCHEOPS = Modified Children's Hospital of Eastern Ontario Pain Score; PAED = Paediatric Anaesthesia Emergence Delirium score; PBRS = Procedural Behavioural Rating Scale; PHBQ = Post-Hospitalisation Behavioural Questionnaire by Vernon et al. (1966); PPPM = Parents' Post-operative Pain Measure; STAI = State-Trait Anxiety Inventory; STAIC-S = State-Trait Anxiety Inventory for children (State form); STAI-S = State-Trait Anxiety Inventory (State form); VAS = Visual Analogue Scale; POD = post-operative day; RR = recovery room; VR = virtual reality.