Overview of papers included in the review

Reference	Study aims	Study design	Burnout measure used	Setting/PICU sample	Demographics	Burnout results	Limitations
Akman *et al.* 2016 Turkey (24)	To determine job satisfaction and burnout in pediatric nurses.	Cross-Sectional design	MBI 22 items	Four centres and hospitals: PICU, NICU, emergency, surgical, general pediatrics. Pediatric nurses n=165. PICU subset n=41 (24.8%)	100% female, Mean age 28.95 (SD 6), range 18–55 yrs, Average yrs of working 7.56±6.25. Yrs ped nurse 4.77±4.70. 70% baccalaureate Degree 11.3% Masters, 49.4% never married	Burnout reported as low/moderate. EE M=18.22 SD 5.36; Moderate score; DP M=5.90 SD 3.98; Low score PA M=9.92 SD 4.62 was positively high in all services. * may be interpreted incorrectly. Age, marital status, number of assigned patients and job satisfaction impacted burnout levels.	Small sample size. PA scores may be interpreted incorrectly. Data collection over several months so scoring on different seasons, acuity, populations of children. Health and cultural differences may not be generalised findings. Nurses pay rates so low 20.6% did not cover monthly expenses.
Berger *et al.* 2015 USA (15)	To determine prevalence of compassion, fatigue and burnout in pediatric nurses.	Cross-Sectional Design	Professional Quality of Life Scale: Version 5 (ProQOL, V5)	Five hospitals within one health system. Pediatric nurses n=239 PICU subset n=52 (22%) 34% response rate	98% female. 52% participants over 40yrs. 74% >5yrs experience, 70% baccalaureate degree	Burnout reported as moderate. Burnout (M, SD) 48.1 (10.1) Moderate. Medical/surgical unit nurses reported higher burnout than PICU (P<0.05).	Burnout reported as a total score. Raw data and cut-off scores not provided. Single center.
Branch *et al.* 2015 USA (16)	To determine prevalence of compassion fatigue among pediatric health professionals.	Descriptive Cross-Sectional Design	Professional Quality of Life Scale, Version 5 (ProQOL, V5) 30 items	Single Center Pediatric hospital. Cardiac ICU, ER, Cardiology, Oncology, PICU. Nurses/allied health professionals n=296, PICU subset n=73, Response rate of 60%	86.9% women, 66.5% <41 years, 58.5% <10 years healthcare experience. 65.1% baccalaureate degree	Burnout reported as high. BOS M F value (df) 52.3 [9.7] – moderate. Univariate 2.19 (5,250). PICU scored significantly higher than staff in any other pediatric unit. Higher acuity patients led to higher burnout.	Cut-off scores not provided. Single center.
Buckley *et al.*, 2019 Canada (31)	To measure burnout in pediatric CCU and PICU nurses and explore the relationship between burnout and attitudes to patient/family engagement.	Cross-Sectional Design	MBI 22 items	Single tertiary hospital. Nurses n=134, PICU subset n=86 (64%), Response rate 78%	49% 2–10 yrs critical care experience 69% worked fulltime 75% worked shift work	Burnout reported as low. Median IQR. EE =17 (IQR 12–24), Low DP =7 (IQR 4–10) Mod PA =36 (31–40) Mod CCU had significantly higher Median (IQR) EE 23 (18–29) than PICU 17 (14–24) (P=0.02). Nurses with high engagement with families and end of life care had higher levels of PA.	Single center. No causation.
Colville *et al.* 2017 UK (27)	To examine association with symptoms of burnout and work-related PTSD in adult and pediatric intensive care staff.	Cross-Sectional Design	aMBI 9 items	Two sites. Three adult ICUs and four PICUs. Physicians and Nurses Total n=377. Adult ICU n=174, PICU Physicians and nurses n=203 (54%), Response rate 51%	83% female, 40% aged 31-40yrs, 20% lived alone, 79% Nurses, 40% had children at home, Mean age since qualified in professions 12.6 yrs, Mean PICU experience 7.8 years	Burnout reported as high. PICU Burnout higher (Yes n=81,42%, No n=114, 59%) compared to Adult ICU (Yes n=50, 31%; No n=114, 70%). Burnout associated with anxiety (odds ratio, 10.56; 95% CI, 4.12–27.02; P<0.001). Self-reported resilience strongly associated with decreased burnout (odds ratio, 0.52; 95% CI, 0.36–0.74; P<0.001). Physicians twice as likely to be at risk of BO (odds ratio, 2.11; 95% CI, 1.18–3.78; P=0.012). Debriefing reduced risk of burnout odds ratio, 0.45; 95% CI, 0.21–0.95; P=0.036). Venting emotion (odds ratio, 1.92; 95% CI, 1.12–3.31; P=0.018) and using alcohol (odds ratio, 2.30; 95% CI, 1.26–4.20; P=0.006) were associated with a doubling in risk of reporting burnout.	Required high scores in one domain only to be reported as burnout.
Czaja *et al.* 2012 USA (17)	To examine potential diagnosis of PTSD in pediatric acute care nurses.	Cross-Sectional Design	MBI 22 items	Single tertiary hospital. Medical, surgical, oncology and emergency nurses. n=173 PICU subset n=36 (21%) 43% response rate	93% female, Mean age 35 (range 23–59 yrs), 53% married, 36% have children, 89% baccalaureate degree	Burnout reported as high. No BOS n=8/35 (22.82%), BOS n=21/35 (60%), BOS and PTSD n=6/35 (19%), Symptoms related to burnout were work conditions: feeling overextended, fear of adverse events, poor team interactions and threats from families.	Raw burnout scores not reported. Percentages only provided. Single center.
Eagle *et al.* 2012 USA (18)	To evaluate current rates of grief and burnout among PICU health care professionals in PICU: To explore facilitated support sessions as method of reducing grief perceptions and burnout among providers.	Cross-Sectional Design. Phase one: Pre-test; Phase Two: Intervention: Peer support sessions; Phase Three: Post-test	Copenhagen Burnout Inventory (CBI) 19 items	One tertiary pediatric hospital PICU physicians, nurses, social workers and respiratory therapists. Pre-Test n=23, Post Test n=18, Total n=41	57% 1–5 yrs work experience	Burnout reported as low. Pre-test: Client BO 20.80, Personal BO 39.83, Work-related BO 36.80. Post-test: Client BO 21.76, Personal BO 39.83, Work-related BO 36.80, No statistical significance.	CBI pre and post-test total and domain subscores not statistically significant. Statistically, intervention did not impact scores.
Fields *et al.* 1995 USA (4)	To determine prevalence of burnout in PICU Physicians.	Cross-Sectional Design	The Burnout Scale 21 items	Pediatric Section Physicians of the Society of Critical Care Medicine Pediatric Intensivists n=389	81% Male, Mean: men aged 40–45 yrs who had practiced 7–12 yrs; Mean: women aged 38–42 practiced 5–9 yrs	Burnout reported as high. Mean burnout scores 3.1 +/-0.8, 36% of participants classified as being 'at risk' for burnout. 14% of participants classified as burned out. Strong association between burnout and undervalued. Exercise was found to be protective.	No cut off scores provided. No raw data provided only percentages. No limitations reported. Older study.
Galvan *et al.* 2012 Argentina (29)	To measure burnout in PICU doctors.	Cross-Sectional Design	MBI 22 items	Physicians who work in public and private PICUs n=162 60% response rate	57% female Mean age 42±7.4 yrs, 19% single 71% had children Mean PICU experience 11±7.5 yrs (range 1–32 yrs), 21% working in three or more facilities 40% had an oncall load greater than 36 hours.	Burnout reported as high. EE= 20 [9.97]; Mod DP=5.7 [4.8]; Low PA =30 [7.15]; High High association between being single and burnout (P<0.01). 80% of participants reported no expectation of continuing work in the specialty in the future.	Scoring system different to MBI recommendation. EE mean scores 20 (SD 9.97) is moderate (MBI high ≥27). DP mean 5.7 (SD 4.8) MBI ≥10 high. 80% of participants reported no expectation of continuing work in the specialty in the future. Argentina's health system and conditions may not be comparable to other PICUs with concerns about salary, increased on-call duties, temporary contacts.
Garcia *et al.* 2014 Brazil (30)	To determine prevalence of burnout and risk factors in pediatricians	Cross-Sectional Design	MBI 22 items	Two tertiary referral hospitals. Pediatricians and pediatric intensivists n=70, PICU subset n=35	PICU Demographics, 79% women, 69% Married, 60% children, 43% >40 yrs, 89% graduate >5 yrs ago	Burnout reported as high. EE 31 [21–39] =63% High. DP 11 [5–13] = 40% High. PA 36 =34% Moderate. 17% scored high in all three subscale.s Burnout higher in PICU consultants than general pediatricians (71% vs. 29% respectively; P<0.01). Average score higher in EE and DP and lower in PA in the PICU group (P<0.01). Multivariate analysis found odds ratio for burnout in pediatric intensivists was 5.7 (95% CI, 1.9–16.7; P<0.01).	Total scores only. Burnout reported if high in one of the domains. Brazil identifies as a 'developing' country health system. Conditions may not be comparable to other PICUs due to on-call demands.
Gribben *et al.* 2019 USA (23)	To determine prevalence of compassion fatigue, burnout, and compassion satisfaction and identify potential personal and professional predictors of these phenomena in pediatric critical care providers.	Cross-Sectional Design	Compassion Fatigue and Satisfaction Self-Test 66 items	PICU Fellows and Attending Physicians n=475 35.7% response rate.	54.5% female, 77.7% Caucasian 83.2% Spouse 54.5 % 0–10 yrs experience	20.49 [9.18] Mean score for burnout. Prevalence for burnout 23.2% (95% CI, 19–27%). Preparing for didactics, compassion fatigue scores, distress about administrative issues and/or co-workers, and 'self-care is not a priority' were each significant determinant for higher burnout scores.	Sample size small from total population approached. Generalizability of the study may be difficult as most were Caucasian, junior faculty and worked in academic medical centres.
Jones *et al.*, 2019 UK (28)	To determine prevalence of work-related psychological distress in staff working in UK PICUs.	Cross-Sectional Design	aMBI 9 items	Interdisciplinary staff (physicians, nurses, allied health, technicians, clerical and housekeeping staff) working in 29 PICUs and 10 PICU transport services n=1,656	95% nurse female, 49.3% physicians male, Median age nurses 33 yrs, Median age doctors 40 yrs, 56.75% considered 'junior' staff	Burnout reported as high. Overall burnout among respondents =47%. 50% nurses (n=594/1,195), 37% physicians (n=27/99) and 45% (n=86/192) other staff had high burnout scores (χ^2 test, P=0.0004). Nurses had a higher mean aMBI EE. Physicians reported highest aMBI-DP mean scores. 47% (n=779) scored in high range for burnout (≥6/18 on aMBI-DP subscale or ≥9/18 on aMBI-EE subscale). Junior doctors at highest risk of burnout. Larger PICU unit size associated with higher burnout. 39% (n=645) respondents considered leaving PICU at some point; 370 (22%) were considering leaving.	Burnout reported if scored high in EE or DP. May not be representative of population. Respondents were informed survey was evaluating burnout prior to involvement and may have created bias.
Lazaridou *et al.* 2011 Greece (25)	To explore severity of professional burnout in NICU and PICU doctors and nurses while identifying associated factors.	Cross-Sectional Design	MBI 22 item.	Single general hospital NICU and PICU. Physicians and nurses n=52 PICU subset n=14	94.2% female; 54% over age 40 years; ICU experience Mean 14.5 years (range 2–29 yrs)	Burnout reported as high. EE 35.4 [10.1], DP 13.0 [5.9], PA 30.6 [9.0]. PICU staff scores indicative of severe burnout on all three domains. PICU higher in EE and DP and lower in PA than NICU staff. DP scores were significantly higher in PICU than NICU (P=0.032).	Very small PICU sample size. Cut-off scores not provided. Health system and resources in Greece may reduce generalization due to understaffing and reported issues of poor health among staff
Lin *et al.* 2016 Taiwan (32)	To examine the relationship between work stress and depression; and investigate the mediating effect of occupational burnout among nurses in PICUs.	Cross-Sectional Design	Occupational Burnout Inventory (Chinese Version) 21 items	PICUs in 7 teaching hospitals. PICU nurses n=144	Mean age 35.72 yrs (Range 22-55 yrs); 39.6% University education; 52.1% unmarried; 61.1% no children; Mean 7.8 yrs work experience	Burnout reported as moderate. Personal burnout = 58.37 [21.55]; Over-commitment =52.88 [17.74]; Work-related burnout =51.46 [20.58]; Client-related burnout =37.50 [17.53]; Occupational burnout mean total score =200. 21 [62.84]	Cut-off scores not provided. Different health and cultural systems may make generalizability difficult
Rehder *et al.* 2014 USA (19)	To characterize current state of 24/7 in-hospital pediatric intensivist coverage in academic PICUs, including perceptions of faculty and trainees regarding advantages and disadvantages of in-hospital coverage.	Cross-Sectional Observational Study	aMBI 9 items.	PICUs at North American Academic Institutions. 74% (n=147/200) of PICU centres participated. Pediatric intensivists and critical care fellows and residents n=1,323	Years of experience: Attending physicians: median 8 yrs, IQR 4-18 yrs; paediatric critical care fellows: PGY-4, 33%; PGY-5, 33%; PGY-6, 24%, PGY-7+, 10%; paediatric or medicine-pediatric residents: PGY-1, 7%; pGY-2, 46%; PGY-3, 44; PGY-4, 3%. Fellowship Program: Attending physicians: 73%; paediatric critical care fellows: n/a; paediatric or medicine-pediatric residents: 39%	Burnout scores reported as moderate to low. Intensivists median burnout scores highest for EE (6 of a possible 18; IQR, 3–9). PA (2 of 18; IQR, 1–5). DP (2 of 18; IQR, 0–4). EE and DP increased (P<0.0001) as physicians spent more nights per month in the hospital working. EE was lower (P=0.006) for intensivists when the unit was covered 24/7 by either a fellow or midlevel provider. PA increased with years of experience as an intensivist (P=0.02). Burnout scores not different based on current coverage model. Increased physician burnout not demonstrated for those hospitals with in-hospital coverage models. Burnout risk correlated more to job characteristics than coverage models. Burnout in PICU lower than previously reported adult ICU physicians.	Cut-off scores not provided. Not scored according to the MBI. Burnout analysed in relation to coverage models only
Rodriguez-Rey *et al.*, 2018 Spain (26)	(I) To explore prevalence of burnout syndrome (BOS) and posttraumatic stress disorder (PTSD) in staff working in the pediatric intensive care unit (PICU) and compare with general pediatric staff; (II) To explore how resilience, coping strategies, and professional and demographic variables influence BOS and PTSD.	Cross-Sectional Study	MBI 22 item	PICU and pediatric wards in nine hospitals. Total n=487; PICU staff members n=298 (57 physicians, 177 nurses, 64 nursing assistants). Professionals working in non-critical pediatric units n=189 (53 physicians, 104 nurses, 32 nursing assistants).	82.6% female; age: mean 40.2 years; 46.6% married; 50% have children	Burnout scores reported as high. 56% of PICU reported burnout in one dimension. EE>24=36.2% Mod DP>9=27.2% Mod PA>39=20.1% High. No difference in the 3 dimensions of burnout between PICU and other pediatric staff. Burnout consistent among disciplines. Coping style a stronger predictor in low burnout than resilience.	Used different cut-off ranges to MBI recommendations. Used EE ≥24, MBI EE ≥27, Used DP ≥9, MBI DP ≥10. May not have reversed the scores for PA. Used PA ≥39 reported high PA as high burnout. MBI ≥40, high PA =low BOS. Burnout reported if scores high in one dimension. MBI recommends two scores
Sacco *et al.* 2015 USA (20)	To establish prevalence of compassion satisfaction and compassion fatigue in adult, pediatric, and neonatal critical care nurses; and to describe potential contributing demographic, unit, and organizational characteristics.	Cross-sectional Design	ProQOL v5 30 items	NICU and PICU nurses in single tertiary academic medical centre. Critical care nurses n=221. PICU subset n=33.	94.6% female; 38.5% over 40 years of age; 41.5% >10 years experience; 80% Bachelor or Masters qualification	Burnout reported as low to moderate. 66% = Low, 32% = Mod, 2% = High. Total sample: Nurses 40–49 yrs: higher burnout (P=0.002). Nurses working on mixed-acuity units had significantly higher burnout (P=0.004). Low level burnout: single acuity 64%, mixed acuity 42%. Nurses who had a change in management in last year reported higher burnout (P<0.001).	Scores reported as a graph with percentages, no raw data. Cut-off scores not provided. Single center.
Shenoi *et al.* 2018 USA (21)	To estimate prevalence of physician burnout, psychological distress, and association with selected personal and practice characteristics among pediatric critical care physicians, and evaluate relationship between burnout and psychological distress.	Cross-Sectional Design	MBI 22 items	Pediatric critical care practices in the USA. PICU Physicians n=253	60.5% male physicians; 77.5% aged >40 yrs; 80% married; 84% had children 69% >10 yrs practice	High burnout scores reported. Males: High EE =29.4%, High DP=19%, Low PA=16.3%. Females: High EE=42%, High DP= 21.2%, Low PA=29.9%. Total Scores: High EE – 34%, High DP- 20%, Low PA- 21%. 49% of participants scored high burnout in one of the three subscales (49%, 95% CI, 43–55%, n=124). Female PICU physicians twice as likely to report BO (odds ratio, 1.97; 95% CI, 1.2–3.4). Gender difference not significant for severe burnout. Age 51-60 yrs: highest BOS 22.8%. Association between severe burnout and psychological distress (adjusted OR, 8.64; 95% CI, 4.29–17.39); 68.5% (n=37). Burnout: four times (adjusted OR, 4.0; 95% CI,2.23–7.18) more likely to have considered leaving practice, those who experienced severe burnout nine times (adjusted OR, 9.35; 95% CI, 3.21–27.27) more likely to have considered leaving practice. Those who experienced any burnout were less likely (adjusted OR, 0.33; 95% CI, 0.17–0.64) to consider pediatric critical care. Mixed acuity higher BOS. Exercise was found to be protective of burnout.	Non-random, relatively small sample; Online survey vulnerable to non-response bias; Impact of organisational factors on burnout not measured
Weigl *et al.* 2015 Germany (10)	To determine association between work stress, burnout and quality of care	Cross-sectional design	MBI 22 items	Single academic children's hospital. Pediatricians n=96; PICU physician subset n=26	50% male; Age Mean 37.19 yrs; Mean 8.42yrs Professional tenure; 84.6% Married/partnered; 96.2% full-time contract; Career Stage: Head or senior physician, 30.8%; specialist, 38.5%; junior physician, 30.8%	General pediatricians had higher EE and DP than PICU. Junior pediatricians had higher DP than experienced pediatricians. Mean & SD PICU EE 2.15±.79, DP 1.18±Pro .88. Outpatient Dr EE 2.53±.95. DP1.47.8±1 Inpatient Dr EE 2.88±0.82, DP 1.52±0.73 EE (P=0.001)	Single Tertiary Pediatric center
Wolfe & Unit 2017 USA (22)	To measure prevalence of depression and burnout at completion of PICU rotation	Cross-sectional study. Longitudinal Study. Phase One: Prior to PICU rotation. Phase Two: End of PICU rotation	MBI 22 items	Single PICU in academic centre. Phase One: PICU only n=24 Residents. Phase Two: PICU only n=17 Residents	100% 2nd year paediatric residents; 83.3% female; nil age or other demographic characteristics reported	Burnout reported as high. Baseline (pre-rotation): EE>26=41%* Mod DP>9=41% Mod PA<34=13%* Mod. After PICU rotation: EE>26=59%*, DP>9=53%, PA<34=0* (P≤0.001). Prevalence of residents meeting criteria for EE increased from 41% to 59%; DP increased from 41% to 53%. Fewer residents had low PA scores at the end of the rotation: 13% to 0%. Prior to rotation: 91% anticipated a positive experience. Post rotation: 82% reported a positive experience.	Response rate of 40% (n=24/60). Small sample

PICU, Pediatric Intensive Care Unit; CCU, Cardiac Critical Care Unit; MBI, Maslach Burnout Inventory; aMBI, abbreviated Maslach Burnout Inventory; NR, not recorded; NICU, neonatal intensive care unit; gen peds, general pediatric ward; ER, emergency; PTSD, post-traumatic stress disorder. ProQol, V5, Professional Quality of Life Scale Version 5; BO, Burnout; BOS, Burnout Score.