*Characteristics of Included Studies*

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| *Study* | *Virus studied or*  *Simulation* | *Study Design* | *Number of*  *Participants* | *Primary Outcomes*  *-PAPR focused* | *Secondary Outcomes*  *-PAPR*  *focused* | *Results* | *Level of Evidence* |
| Andonian at al 2019  (1) | Simulation of training on PPE doffing including PAPR | Randomised Controlled Trial | 48  (13 HCW in intervention group and 13 HCW control group)  -others randomised to Doffing Assistants | 1.Effectiveness of training on contamination of a number of body sites | 2. Effectiveness of training on contamination using ultraviolet light and PLS swabbing | -11/13 HCW contaminated at least one body site;  -13/13 HCW contaminated at least one body site;  -median contamination score lower in the intervention group: 23.15 vs 64.45 p=0.004 (ultraviolet light);  - median contamination score lower in the intervention group:72.4 vs144.8 p=0.001 (PLS visualization); | 2 |
| Chughtai et al  2020  (2) | Simulation by fit-testing and use of PAPR | Observational | 20 | 1.Examine attitudes and practices regarding PAPR | 2. Determine acceptability of a novel PAPR (CleanSpace2tm) | -14/20 participants found PAPR easy to don;  -15/20 participants found PAPR easy to doff;  -14/20 participants found PAPR comfortable to wear; | 4 |
| Chughtai et al 2018  (3) | Simulation of doffing protocols including PAPR | Observational | 30 PPE sequences tested, 6 including PAPR  (10 participants) | 1.Evaluate risk of self- contamination using ultraviolet light | 2.Evaluate user level of comfort  Including breathability and ease of breathing | -4/24 participants contaminated using N95;  -0/6 participants contaminated using PAPR;  -24/24 reported discomfort with N/95 use;  -2/6 reported discomfort with PAPR use; | 3 |
| El-Boghdadly et al 2020  (4) | Field study  of SARS-CoV-2 | Observational  -prospective international multicentre cohort study | -1718 healthcare workers reported 5148 tracheal  intubation episodes;  -exact protective equipment composition not reported but included N95/P2/P3/  PAPR | The primary endpoint was the incidence of laboratory-confirmed COVID-19 diagnosis or  new symptoms requiring self-isolation or hospitalization after a tracheal intubation episode. | N/A | -overall incidence of COVID outcomes was 10.7% over a median follow up of 32 days;  -risk of the primary endpoint varied by country and gender, higher in females; | 3 |
| Powell et al  2017  (5) | Simulation assessment of participant comfort | Observational | 60 total assessments  (12 participants)  -12 N95;  -12 tight fit PAPR;  -24 loose PAPR;  -12 hybrid PAPR;  (note hybrid PAPR excluded from analysis) | 1. Evaluate face and body thermal sensations; | 2. Evaluate wearer comfort through assessment of eye dryness; | -temperature of facial skin lower in 36 PAPR compared to N95;  -tight fitting face piece PAPR increased eye dryness;  -loose fitting PAPR did not increase eye dryness;  -perception of comfort equivalent in two groups;  -perception of work of breathing was equivalent in the two groups; | 3 |
| Schumacher  et al 2009  (6) | Simulation study of impact of respiratory  protective  equipment during emergency life support | Randomised cross-over  simulation study | 42 total assessments  (14 paramedics)  -three types of respiratory equipment:  1.PAPR  (positive pressure)  2. Standard APR ( negative pressure)  3. Standard surgical protection  (control group) | 1.Difference in treatment times in two resuscitation scenarios, with standard equipment use serving as control | 2. Wearer comfort as measured by user rating of  -mobility  -ease of communication/audibility  -ease of breathing | -The participating paramedics rated the ease of breathing with the PAPR system significantly better than with the APR.  (p<0/05);  -The wearer comfort in respect of mobility and the ability to communicate was similar in both respirator groups; | 2 |
| Schumacher  et al 2013  (7) | Simulation study of impact of respiratory  protective  equipment during emergency paediatric support | Randomised cross-over  simulation study | 48 total assessments  (16 paramedics)  -three types of respiratory equipment:  1.PAPR  (positive pressure)  2. Standard APR ( negative pressure)  3. Standard surgical protection  (control group) | 1.Difference in treatment times in two resuscitation scenarios, with standard equipment use serving as control | 2.Wearer comfort as measured by user rating of  -mobility  -noise/speech intelligibility  -heat | -Study subjects reported that communication (p=0.001) and mobility (p=0.000) were significantly improved in the APR group compared to PAPR;  -Study subjects reported that heat-build-up was significantly less in the PAPR-hood group (p=000); | 2 |
| Schumacher  2020  (8) | Simulation study of impact of respiratory  protective  equipment on airway  management | Randomised cross-over  simulation study | 300 total assessments  (25 anaesthetists)  -three types of respiratory equipment:  1.PAPR  (positive pressure)  2. Standard APR ( negative pressure)  3. Standard surgical protection  (control group)  -Four different intubation drills | 1.Difference in  Intubation times in different airway scenarios | 2.Wearer comfort as measured by user rating of  -mobility  -noise  -heat  -vision  -speech intelligibility | The powered respirator ensemble scored significantly better in user rating for  -heat (p=0.002)  -vision (p=0.008)  The powered respirator ensemble scored significantly worse in user rating for  -noise (p=0.021)  -speech intelligibility (p=0.062) | 2 |
| Yao et al  2020  (9) | Field study  of SARS-CoV-2 | Retrospective observational case series of two centres | 1.outer layer with full PAPR n=50;  2.1.outer layer with goggles, FFP2/N95 with a face shield n=22;  2.2 outer layer with goggles, FFP/N95 with a full hood without positive pressure n=130; | Analysis of two centre data by a panel of international experts where  both groups wore an inner layer of protection in addition to designated protective equipment;  A number of recommendations were made on the analysis of data and opinion on experts; | | -zero transmission rates were noted in both groups;  -larger series is needed to give greater confidence;  -experts noted that outcome data, or the association between level of PPE and coronavirus transmission from the current epidemic are lacking; | 3 |
| Zamora et al  2006  (10) | Simulation assessment of contamination | Prospective randomised controlled cross over study | 50 participants  (PAPR versus E-RCP) | 1.Evaluate any contamination, size of contamination area; | 2.Donning non-compliance;  3.Doffing non-compliance; | -13/50 any contamination PAPR group;  -48/50 any contamination E-RCP group;  -15/50 donning non-compliance PAPR;  -2/50 donning non-compliance E-RCP;  -6/50 doffing non-compliance PAPR  -12/50 doffing non-compliance E-RCP; | 2 |

Studies:

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3. Chughtai AA, Chen X, Macintyre CR. Risk of self-contamination during doffing of personal protective equipment. American journal of infection control. 2018;(no pagination).

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6. Schumacher J, Gray SA, Weidelt L, Brinker A, Prior K, Stratling WM. Comparison of powered and conventional air-purifying respirators during simulated resuscitation of casualties contaminated with hazardous substances. Emergency medicine journal. 2009;26(7):501‐5.

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