



A Meta-Analysis of Crew Resource Management/Incident Command Systems Implementation in the Fire and Emergency Services

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Overview

- Origins of CRM
- CRM/ICS in the Fire and Emergency Services
- Studies included in Meta Analysis
- Results
- Conclusions
- Recommendations



Origins of CRM

- Flt 173 in 1978
- MRM Early 1990s US Air (codified in 2000)
- Sexton et al. and Medical CRM (2000)
- Firefighters and EMS
 - “...firefighter deaths have plateaued...(the idea that) ‘only the lead dog has a good view’ idea has come and gone...leaders must buy into CRM” (Lubnau and Okray, 2001)



CRM/TRM/ICS

- Inquiry to evaluate procedure
- Advocacy to respectfully question authority
- Conflict resolution to learn from errors
- Strong leadership to make group decisions
- Observe/critique team decisions to meet mission goals
- Open and accepting team environment
(LeSage, Dyar, & Evans, 2011)



Previous studies

- Positive Results knowledge acquisition and behavior by numerous researchers
- Leverage what has been done in the aviation and medical fields with regard to CRM....

Fisher, et al., 2000; Helmreich & Foushee, 1993; Helmreich & Wilhelm, 1991; O'Connor, et al., 2008; Salas, Prince, Bowers, Stout, Oser, & Cannon-Bowers, 1999a; Salas et al., 2006).



Methods

- Search/Criteria
 - Internet - ProQuest
 - Quantitative output
 - Measure student knowledge
 - Exclude study results without student measures
- Treatment
 - MedCalc to measure standard mean differences (effect sizes – Hedges g statistic)
 - Significance - Full and random effects models
 - Heterogeneity - Cochran's Q and I^2



Studies Used

Study	Design	Sample test results	Intervention	Outcomes
Glow, Colucci, Allington et al. (2013) Fire fighters /prehospital EMS	One-group pretest-posttest design. Scores of CRM trained (n=68) vs scores prior to training (n=70).	138	Crew Resource Management training course	p<.001
Fisher (2000) Aeromedical Aircrew	Posttest only control group design. Scores of CRM trained (n=59) vs those who were not trained (n=8)	67	Crew Resource Management Training course	p =.031
Hagemann, Kluge, Greve (2012) Fire fighters (1 day after training)	One group pretest-posttest design. Group tested before CRM training and one month after training.	56	CRM ½ day training session	p<.001
Hagemann, Kluge, Greve (2012) Fire fighters (7 months after training)	One group pretest-posttest design. Pre training and 7 month post training scores compared	22	CRM ½ day training session	p=.001



Meta-Analysis Results

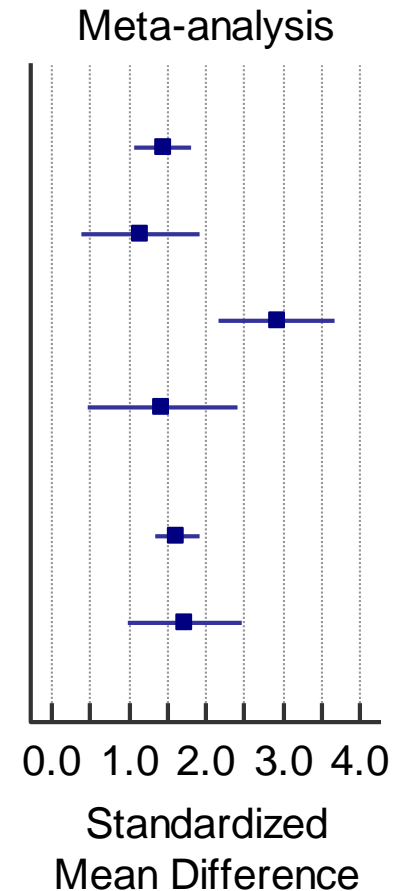
Study	Total	SMD	95% CI	t	p
Glow et al., (2013) EMS and Firefighters	138	1.445	1.068 to 1.821		
Fisher et al., (2000) Aeromedical Aircrew	67	1.139	0.370 to 1.909		
1 day Hagemann et al., (2012) Firefighters	56	2.918	2.153 to 3.683		
7 mo Hagemann, et al., (2012) Firefighters	22	1.435	0.468 to 2.402		
Total (fixed effects)	283	1.620	1.329 to 1.910	10.969	<0.001
Total (random effects)	283	1.726	1.000 to 2.452	4.678	<0.001



Forest Plot

Glow et al., (2013) EMS and Firefighters
Fisher et al., (2000) Aeromedical Aircrew
1 Day Hagemann et al., (2012) Firefighters
7 Mo Hagemann et al., (2012) Firefighters

Total (fixed effects)
Total (random effects)





Heterogeneity

- Q value of 14.143 (3 degrees of freedom, $p=.0027$)
- I^2 statistic indicated a 78.79% inconsistency level
 - 95% confidence interval for I^2 was 43.14 to 92.09



Findings

- All four results
 - CRM training significantly positive effect $p < .001$
- Meta-Analysis of all studies
 - Significant positive effect $p < .001$ (fixed and random effects models)
- Heterogeneity
 - Significant amount of variation between studies
 $I^2 = 78\%$



Conclusions

- Evidence to support the effectiveness of CRM training in the fire and emergency services
- Variation between study results due to different teaching and training methods
- Evidence to support the need for continuous training to maintain knowledge
- Possible publication bias



Recommendations

- Interdisciplinary training should be conducted periodically (Glow et al., 2013; Hagemann et al., 2012).
- Ongoing training should be tailored to specific professional disciplines (Glow et al., 2013).
- CRM training has shown to be effective. Leadership needs to create a continuing culture of CRM principles (Fisher et al, 2000).
- Future studies should focus on outcomes based on testing

Questions?

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