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| Study  | Research method  | Number of facilities | Country | Specific to disaster | Program of assessment (case study, comparative) | Tool Used and assessment type  | Tool | Structural elements | Non-structural elements | McMasters summary of paper  | Summary of results  | Summary of conclusions /recommendations  |
| Achour, et al. 23  | Mixed Method  | 66 | Japan  | Earthquakes | Cross sectional study  | Self-developed tool Self-assessment / independent interviews  | Own survey | Structural damage assessment | Yes  | Sufficient sample size, may not be generalisable due to bias in sample  | The most important utility for the operation of the hospital is electric power.  | Recommendation to improve resilience of utility infrastructure, improve alternative sources, ensure utilities supplies are covered by resilience codes and legislation |
| Ahmadi, et al. 24 | Quantitative  | 26 | Iran  | NO  | Cross sectional study  | Independent review | WHO safe hospitals (2010)S, NS, F indicators | No  | Yes | Limited sample size due to drop outs Statistical significance reported  | Hospital resilience rated as medium overall, with multiple areas rated as low | Recommendation for hospital managers to consistently review and action areas of vulnerability  |
| Aladhrai, et al. 25  | Quantitative  | 11 | Yemen | Revolution  | Comparative study  | Self-evaluation Independent interviewer  | WHO Hospital Emergency response checklist  | No | Yes | Good design, bias explained, appropriate statistics Interventions assessed appropriately with same tool  | no significant improvements in disaster preparedness found between time points  | Despite checklist being circulated, no improvements in systems identified  |
| Ardalan, et al. 26  | Quantitative  | 421 | Iran  | NO | Cross sectional study  | Self-assessment – training provided  | HSI 1st ed – Farsi edition  | Yes | Yes | Good design, pure quantitative analysis, dropouts explained,  | Average safety rating – improvements seen after introduction of HSI  | Self-assessment allowed self-learning, easy to propagate through all health services, potential for bias  |
| Asefzadeh, et al. 27 | Quantitative  | 2 | Iran  | No | Cross sectional study  | Independent assessment | HSI 1st ed – Farsi  | Yes | Yes | Good design, analysis appropriate, Study site characteristics not well explained | High safety rating with some exceptions  | Pilot study with recommendation for all hospitals to be assessed. Acknowledge large number of assessment items and time required to undertake each survey  |
| Bajow and Alkhalil 28 | Quantitative  | 6 | Saudi Arabia  | NO | Cross sectional  | Self-Assessment  | Self developed – from HSI | YES | YES  | Study design well explained, appropriate statistics  | hospitals have tools and indicators in hospital preparedness but they lack both training andmanagement during disaster.This research has provided hospital disaster preparedness (HDP) assessment tool that help in improving progressand effectiveness of hospital disaster preparedness improvement | Local communities must also be made familiar with the hazards to which they are exposed and assistin building the local capacity for interpreting early warningAlso special budget for disaster and emergency equipment’s should also be determined |
| Baruwal, et al. 29 | Mixed method  | 9 | Nepal | Earthquakes | Cross sectional study | Majority of sites – independent1 site self-assessed  | WHO Hospital emergency response checklist and WHO HSI checklist  | Yes | Yes  | Paper has minimal methodology attached,  | Aim of paper to compare two checklists to determine validity Conclusion both methods yield similar results  | HSI tool requires calculator to determine safety level Requires expert knowledge  |
| Der-Martirosian, et al. 30 | Quantitative  | 137  | USA | No | Cross sectional study  | Independent evaluation – training provided  | VAH disaster assessment tool – own development – VA CEMP survey | No  | Yes | Good methodologyAnalysis appropriate Good description of intervention and analysis of outcomes between 2 time points  | Average safety identified with improvements made between 2 time points  | CEMP has been developed specifically for VA hospitals however may be applicable to other hospitals – requires testing/validatingCEMP survey not validated formally however; little changes made between phases suggest its applicability |
| Djalali A, Ardalan A, Ohlen G, et al. 31 | Quantitative | 9  | SwedenIran  | No | Comparative study  | Self-assessment – training provided  | HSI – non-structural assessment components | No | Yes | Limited explanation of methodology Limitations explained adequately Analysis adequate  | High safety assessments in Sweden, compared with Iran Comparison of developed v underdeveloped nations  |  |
| Dobalian, et al. 32  | Mixed | 140 | USA | No | Cross sectional study  | Independent evaluation  | Development of assessment tool – VA CEMP survey | No | Yes | Descriptive re development of tool, phase 1 and II |  |  |
| Hosseini, et al. 33  | Quantitative | 8 | Iran  | No | Cross sectional study  | Independent evaluation  | Use of Mulyasari et al 38tool  | Yes | Yes | Methodology adequately described and appropriate Comparative results and discussion to other countries assessments  | Hospitals studied were not well prepared overall  | Important to develop hospital preparedness improvement plan – evaluation allows tracking of progress Building should be retrofitted to withstand known hazardsSafe places for evacuation should be considered  |
| Ingrassia, et al. 34 | Quantitative | 15 | Italy |  |  | Independent evaluation  | WHO emergency response checklist  | No | Yes | Good study design, appropriate analysis, sampling effective Limitations identified  | Moderate safety levels identified  |  |
| Janati, et al. 35 | Quantitative  | 18 | Iran  | No | Cross sectional study | Independent evaluation  | WHO emergency response checklist  | No | Yes | Good study design Appropriate analysis methodsValidated results CVI factors included  | Low to Moderate resilience indicated in all hospitals  | Comparison made between hospital types with conclusions made to why differencesResearchers concluded more resources and programs are required to improve safety / resilience levels  |
| Khazaei Monfared, et al. 36  | Quantitative | 6 | Iran |  |  | Independent evaluation  | HSI – Farsi ed  | Yes | Yes | Minimal data available of design, execution and analysis  | Average safety std across 6 hospitals Differences between other studies identified and reasons suggestive of improved preparedness programs post other studies being conducted  | HSI assessment requires expert input in structural aspects – this can be a limitation to study role out  |
| Labarda, et al. 37 | Mixed method  | 2 | Philippines  | Typhoon | Cross sectional study | Self-assessment – checklist Independent reviews to validate and explore  | Zhong checklist  | Yes | Yes | Adequate study design, appropriate analysis – quantitative and qualitive explanations Good descriptions of results Small study sample Limitations identified  | Public hospitals better prepared, compared to private Resilience inherent in community to assist where required  | Descriptive analysis of resilience levels prior to cyclone Haiyan and recommendations for future preparedness |
| Mulyasari, et al. 38 | Mixed | 14 | Japan |  |  | Self-assessment  | Developed own tool – based on HSI criteria  | Yes | Yes | Design and methodology are sound, descriptive analysis sand statistics used  | Average resilience identified across study sites | Continued improvement and integration into everyday recommended  |
| Naser, et al. 39 | Quantitative | 10 | Yemen | No  | Cross sectional study | Independent evaluation  | WHO hospital emergency response checklist  | No | Yes | Good design, analysis appropriate Independent analysis with interview and evidence evaluation removes a researcher bias  | Low preparedness levels across 10 hospitals  | Improvements in resilience require budget and legislation to promote resilience building  |
| Sobhani, et al. 40  | Quantitative | 9 | Iran  | No | Cross sectional study  | Independent evaluation  | Unable to determine  | Unable to determine | Yes | Minimal detail of methodology in Paper, Minimal detail of assessment items in checklist |  |  |
| Sunindijo, et al. 41 | Quantitative  | 15 | Indonesia  | Multiple  | Cross sectional study | Independent evaluation  | WHO HSI ed 2  | Yes | Yes | Good study design, appropriate analysis Limitations explained  | Moderate safety identified despite numerous disasters affecting hospitals  | HSI requires time to undertake and evaluators require training  |
| Toner, et al. 42 | Qualitative | 1  | USA | Hurricane | Case study  | Semi structured interviews – independent  | No identified tool used  | Yes | Yes | Interview questions not identified, themes from results well explained  | Sample not described in detail, development of new checklist Broad purpose  | Wider community health system resilience themes identified Broader study context  |
| Zhong, et al. 43 | Mixed  | nil | China | No | Cross sectional study | Development of tool  | New tool developed  | Yes | Yes | Description of tool development and literature well described New development of tool  | New assessment tool is comprehensive framework with key indicators assessed as useful to disaster managers in determining resilience and developing priority actions for review and improvement |  |
| Zhong, et al. 44 | Quantitative  | 41 | China  | No | Cross sectional | Self-assessment  | Own tool  | Yes | Yes | Pilot and validation of new toolSample size and characteristics well described Results may not be transferable to smaller facilities  | Newly developed framework provides a user-friendly instrument for measuring resilience of a hospital | Structural safety identified as providing less weight to overall resilience due to more measures identified focusing on Disaster Management, and disaster medicine capabilities  |