ORIGINAL RESEARCH

Hospital Ships Adrift? Part 1: A Systematic Literature Review Characterizing US Navy Hospital Ship Humanitarian and Disaster Response, 2004-2012

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Abbreviations:
CRD: Centre for Reviews and Dissemination
DoD: US Department of Defense
HIA: health impact assessment
IOM: Institute of Medicine
NGO: non-governmental organization
SR: systematic review

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Abstract

Background: United States foreign policy is tied extensively to health initiatives, many related to the use of military assets. Despite substantial resource investment by the US Department of Defense (DoD) in hospital ship humanitarian assistance and disaster response missions, the impact of this investment is unclear.

Methods: A systematic literature review of both peer-reviewed and grey literature using eight databases representing the international community and multiple sectors was conducted. Data on the characteristics of missions directly related to US Navy hospital ship humanitarian assistance and disaster response from 2004-2012 were extracted and documented.

Results: Of the 1445 sources reviewed, a total of 43 publications met criteria for review. Six (13.9%) met empirical documentation criteria and 37 (86.0%) were considered nonempirical expert opinions and anecdotal accounts that were primarily descriptive in nature. Overall, disaster response accounted for 67.4% (29/43) and humanitarian assistance 25.6% (11/43). Public and private sector participants produced 79.0% (34/43) and 20.9% (9/43) of the publications respectively. Of private sector publications, 88.9% (8/9) focused on disaster response compared to 61.8% (21/34) from the public sector. Of all publications meeting inclusion criteria, 81.4% (35/43) focused on medical care, 9.3% (4/43) discussed partnerships, 4.7% (2/43) training, and 4.7% (2/43) medical ethics and strategic utilization. No primary author publications from the diplomatic, development, or participating host nations were identified. One (2.3%) of the 43 publications was from a partner nation participant.

Discussion: Without rigorous research methods yielding valid and reliable data-based information pertaining to Navy hospital ship mission impact, policy makers are left with anecdotal reports to influence their decision-making processes. This is inadequate considering the frequency of hospital ship deployments used as a foreign policy tool and the considerable funding that is involved in each mission. Future research efforts should study empirically the short- and long-term impacts of hospital ship missions in building regional and civil-military partnerships while meeting the humanitarian and disaster response needs of host nation populations.

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Introduction

The use of US Navy hospital ships in support of humanitarian assistance missions is perceived by many within the US government and the international community as a pillar of global health diplomacy. In this context, global health diplomacy can be defined as the use of US hospital ships supported by partner nations and non-governmental organizations working in conjunction with host nations to "shape and manage the policy environment for health" and diplomacy.[1] Although the primary mission of Navy hospital ships is to provide mobile medical capability for deployed military personnel, the secondary mission of humanitarian assistance and disaster response has been front and center since the 2004 Asian Tsunami.[2] The U.S. Navy hospital ship Mercy, a 1,000 bed floating hospital, was deployed to the region following the tsunami disaster and provided

humanitarian assistance to over 107,000 patients.[3] National polls in Bangladesh and Indonesia after the mission showed a significant improvement in the overall opinion of the United States among host nation citizens;[4] however, opinions returned to pre-disaster levels within six months.

Attempting to build upon this momentum, the US Department of Defense (DoD) deploys the USNS *Mercy* (T-AH 19) and USNS *Comfort* (T-AH 20) hospital ships every two years to perform humanitarian assistance missions. *Mercy* deploys in support of "Pacific Partnership" missions in the Pacific region, while *Comfort* deploys in support of "Continuing Promise" in Latin America and the Caribbean. Both ships incorporate interagency partners (eg, Department of Health and Human Services) partner nations (eg, the United Kingdom), host nations, and non-governmental organization (eg, Project Hope) personnel in these missions. The purpose is multifaceted and includes efforts to train military personnel, build regional partnerships, support host nation health needs, and support public diplomacy. The perceived positive impact is increasing the use of hospital ships by the US government and other states. China recently built its shallow draft hospital ship, the *Peace Ark*, and deployed it to African nations in 2010 and to Central American and Caribbean nations in 2011.[5-7]

Although actual costs associated with hospital ship missions in support of disaster response and humanitarian assistance missions are not publically available, operational and maintenance estimates (excluding participant salaries) from a publication in 1998 provides some perspective.[8] The original cost per US Navy hospital ship was $514 million. Annual operating costs estimated 15 years ago included $23.5 million for hull maintenance, $19 million for medical equipment, and $2.9 million for medical treatment facility operation and maintenance. Despite substantial investment, the impact of these ships is unclear. Professionals within and outside of the DoD highlight the need for the military to measure the impact of all humanitarian assistance missions.[9-13] Other humanitarian actors are critical of the DoD operating in their neutral "humanitarian space."[14] However, what is not captured through empirical studies is the impact hospital ship missions have on training, partnerships, and crucial health outcomes, among other priority areas, whether they are short- or long-term.

The purpose of this research is to describe the US Navy hospital ship as it portrayed in scholarly literature. This is the first systematic review (SR) to analyze the literature and inform the DoD and partner organizations how each other and the broader international community characterize hospital ship missions. Identifying the mission types, focus areas, and study methods used in the hospital ship literature will highlight gaps in knowledge and serve to inform future studies to fill the void. Part 2 of this research effort will explore how and why U.S. Navy hospital ships influence partnerships among participants.

Methods

Study Design

The systematic review (SR) used standards published by the Institute of Medicine (IOM) of the National Academies and by the Centre for Reviews and Dissemination (CRD).[15-17] The standards are based on scientific evidence and guidance from multiple expert organizations including CRD and Cochrane Collaboration.[15] Members of the IOM acknowledge the daunting tasks outlined in their SR procedures, and recommend researchers use their best judgment when resources are inadequate or steps inappropriate for the research question of interest.[15]

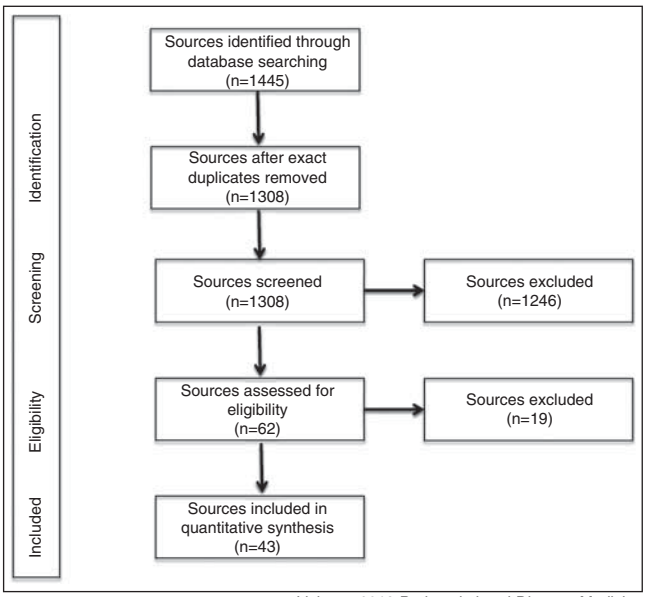

Figure 1. Systematic Review Screening Process

Data Collection

In Step One of data collection, a comprehensive search was conducted. To minimize publication and selection bias, multiple sources of information were explored in a thorough, objective and reproducible manner. This effort was necessary as hospital ship missions are multidisciplinary in nature and may result in information sources produced by different sectors such as public, private, and not for profit. Source material was identified through the systematic search of the following databases: Cochrane Central Register of Controlled Trials, Index Medicus (MEDLINE), Military and Government Collection, PubMed, ProQuest, Public Affairs Information Services International, Scopus, and the Thomson Reuters Web of Knowledge (Table 1). These databases capture both published peer-reviewed studies and grey literature representing the opinions of the international community and various sectors.

The key elements in this study were US Navy hospital ships (resource of interest) and Pacific Partnership and Continuing Promise (humanitarian missions of interest). Unique search strategies were developed to account for the different terminology and software packages of each database. The two elements of interest were searched in the different databases using related terms such as: USNS Mercy/Comfort, hospital ship Mercy/Comfort, Navy medical ship, hospital ship, medical ship, Pacific Partnership, and Continuing Promise. These terms were searched using free text (natural language) and controlled vocabulary (database specific).[18] Terms within each concept were joined using the Boolean "OR" operator to ensure sources containing at least one of the source terms was retrieved.[18]

All search results were imported into RefWorks 2.0 (RefWorks-COS, Bethesda, Maryland 20814 USA) a web based bibliographic management software package. Results were screened to ensure they directly related to US Navy hospital ship missions from 2004-2012. The time period captured all *Mercy* and *Comfort* hospital ship humanitarian assistance missions and disaster responses that included the 2004 Southeast Asia earthquake and tsunami and the 2010 Haiti earthquake. Newspaper articles and press releases were excluded from this systemic review.

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Database	Type	Description	Citations (n)
Cochrane Central Register of Controlled Trials (CENTRAL)	Bibliographic Database	Most comprehensive source of controlled trials in medicine. Contains over 500,000 bibliographic references to controlled trials and other health care interventions as of March 2012. Includes both published and unpublished sources in English and other languages	3
Index Medicus (MEDLINE)	Bibliographic Database	The National Library of Medicine's database contains over 19 million references to journal articles from the 1950s to the present as of March 2012. Over 5,600 journals in 39 languages are indexed.	236
Military & Government Collection	Bibliographic Database and Grey Literature	Current news pertaining to all branches of the military. This database covers approximately 400 titles, with the full text of nearly 300 journals and periodicals and 245 pamphlets.	193
PubMed	Bibliographic Database	More than 21 million citations from biomedical literature from MEDLINE, life science journals, and online books as of March 2012. Includes up-to-date citations not yet indexed in MEDLINE and additional records from journals not indexed in MEDLINE.	14
ProQuest	Dissertation and Thesis Database	Most extensive list of North American theses and dissertations. Over 2 million doctoral dissertations and master theses from 1861 to the present.	221
Public Affairs Information Services (PAIS) International	Bibliographic Database and Grey Literature	More than 668,000 journal articles, books, government documents, grey literature, research reports, conference reports, publication of international agencies, and other material from 1972 to the present as of March 2012.	569
Scopus	Bibliographic Database and Grey Literature	The largest abstract and citation database containing both peer-reviewed research literature and quality web sources. With over 19,000 titles from more than 5,000 international publishers, 18,500 peer-reviewed journals (including 1,800 Open Access journals), 425 trade publications, 325 book series, 250 conference proceedings, over 46 million total records.	141
Thomson Reuters (formerly ISI) Web of Knowledge	Bibliographic Database and Grey Literature	Includes 100 years of fully indexed journal articles, international conference proceedings, pre-published content and other information from the sciences, social sciences, arts and humanities.	68

Table 1. Databases Used in the Systematic Review

Studies and reports in all languages meeting the inclusion criteria of resource, mission, and timeframe of interest described above were screened using a two-stage approach. First, titles and abstracts were screened using the inclusion criteria. Second, a full-text review of sources passing the first screen was conducted to ensure the material was relevant to the study. A PRISMA flow diagram was used to document the number of sources remaining after each step (Figure 1).[19] Material meeting the inclusion criteria was critically analyzed and data extracted.

In Step Two, data was extracted and coded in Stata (version 11.2, StataCorp LP, College Station, Texas 77845 USA) using a standard data extraction form to minimize data entry errors. Data collected included:

- title;
- first author;
- year of publication;
- country of origin (foreign or domestic);
- type of publication (journal, book, chapter, dissertation, thesis, technical report, conference proceedings);
- author affiliation (public sector including development, diplomacy, health - non military, military or the private sector including profit or not for profit);
- mission type (humanitarian assistance, including Continuing Promise and Pacific Partnership, or disaster response, including the Asian tsunami or Haiti earthquake);
- primary focus area (exercise/training, medical care, dental care, veterinary care, partnerships/collaboration); and
- research methodology.

Research methodology was coded as quantitative, qualitative, or mixed methods. Quantitative methodology was further coded as experimental, non-experimental, and quasi-experimental. Qualitative methodology was further coded as narrative, phenomenology, grounded theory, ethnography, or case study. Mixed methodology was coded if both methodologies were used. Articles not using any research method were categorized as other (eg, editorials, opinion pieces, and letters to the editor). Finally, the study setting and outcome results were collected. To further minimize reporting bias, duplicate publications were eliminated.

Data Analysis

Descriptive statistics were calculated for each data variable using univariate analysis, and between major categories using bivariate analysis. Major categories included: (1) country of origin; (2) type of publication; (3) author affiliation; (4) mission

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type; (5) primary focus area; and (6) research methodology. Study setting and outcome results were collected, but due to inconsistent reporting, no analysis was conducted. To determine which organizations and sectors are reporting on humanitarian assistance and disaster response missions, author affiliation and sector by mission type was calculated. In order to gain an understanding of the types of publications generated by the different participating organizations, author affiliation by publication type was calculated. The proportion of medical, dental, veterinary, partnership, and training publications by mission type was also calculated. Finally, to understand how the humanitarian assistance and disaster response publications vary by research methodology, research method by mission type was calculated.

Results

Descriptive Statistics

The number of sources identified for each database are presented in Table 1. An average of 181 sources per database was found, with PubMed yielding the highest at 569 and CENTRAL the lowest at three. A total of 1445 sources were identified, and 1308 remained after excluding exact duplicate matches using RefWorks (Figure 1). Additional duplicates that were not an exact text match were excluded during the screening process. After screening source titles and abstracts, 1246 sources did not meet the inclusion criteria. The remaining 62 sources were reviewed in full. A total of 43 sources met the inclusion criteria and were coded.

Of the 43 sources meeting the inclusion criteria,[20-63] 23 (53.5%) were published in military journals and 20 (46.5%) in health journals. Only one (2.3%) originated from outside the United States (Table 2).[64] This is interesting as this observation challenges the DoD emphasis on partnerships and building relationships with the host nation and other partner nations during these missions. Host nation lessons learned are completely lacking and partner nation experiences are either absent or underrepresented in the literature. All sources meeting the inclusion criteria were from published journals, although one emanated from dissertation research.[65] The dissertation was excluded during the screening process as a duplicate to a 2009 journal article. Primary authors from the public sector* made up 79.0% (34/43) of included sources, while the private sector† made up 20.9% (9/43). Thirty (69.8%) originated from the military,‡ nine (20.9%) from the health sector (non-military),§ and four (9.3%) from the not for profit sector.[22,37,47,61]

Disaster response missions**accounted for 29 (67.4%) of the publications. Humanitarian assistance††made up another 11 (25.6%) and both missions[24,43,59] were discussed in three (7.0%) of the publications. This is not surprising as disaster response missions involving hospital ships gain more visibility than the biennial humanitarian assistance missions. The actual missions described varied, with Operation Unified Assistance (Asian tsunami relief)‡‡ being cited most often in 17 (39.5%) of the publications. Operation Unified Response (Haiti earthquake relief),§§ Pacific Partnership,*** Continuing Promise,[26,34] and "all" missions[24,43,50,59] made up 12 (27.9%), eight (18.6%), two (4.7%) and four (9.3%) respectively. The disparity in publications between Pacific Partnership and Continuing Promise is unexpected, as both *Mercy* and *Comfort* have each conducted three of these humanitarian assistance missions. Overwhelmingly, 35 (81.4%) of the publications focused on medical care,††† four (9.3%) discussed partnerships or collaborations[37,44,55,62], two (4.7%) exercises or training,[20,25] and two (4.7%) ethics and strategic utilization.[28,59] The low proportion of partnership and training publications is interesting as one of the primary purposes of the hospital ship humanitarian assistance missions is to support both the US National Security and National Military Strategies by strengthening interagency, bi-lateral, regional, and international partnerships while providing humanitarian assistance to host nation populations.[66-68]

Of all sources meeting the study inclusion criteria, 37 (86.1%) were nonempirical.‡‡‡ Among these, descriptive or anecdotal accounts of individual experiences§§§ made up 31 (72.1%) of the publications and an additional six (14.0%) were editorials or letters to the editor.[23,24,37,54,59,61] These were not excluded because they satisfied the "expert opinion" criteria for inclusion. Only five (11.6%) of the total sources included in the study used quantitative analysis[25,34,43,48,58] and one (2.3%) qualitative analysis.[19] Of the six empirical publications, five (83.3%) were non-experimental quantitative[25,34,43,48,58] and one (16.7%) grounded theory qualitative.[20] One additional study "offered an illustrative case" and was coded as a qualitative case study although the study design was not explicitly identified.[69] Overall, the results suggest a significant gap in empirical studies.

Bivariate Analysis

Author Affiliation by Mission Type—When considering who is documenting what, 21 (61.8%) of the public sector sources meeting the inclusion criteria focused on disaster response (Table 3). Ten (29.4%) focused on humanitarian assistance. The private sector had a greater affinity for documenting disaster response missions. Eight (88.9%) focused on disaster response while one (11.1%) focused on humanitarian assistance. This is surprising as non-governmental organizations (NGOs) deployed with the Comfort and Mercy on two disaster responses and six humanitarian assistance missions. The humanitarian missions were more frequent and longer in duration, but are clearly underrepresented in the literature. It would be useful to understand through empirical analysis the contribution of each sector to hospital ship humanitarian assistance missions and the health outcomes.

Among private sector publications, six (66.7%) focused on Operation Unified Assistance, two (22.2%) on Operation Unified Response, and one (11.1%) on Pacific Partnership. Neither the public nor private sector publications focused on the Comfort deployment in 2005 to support Hurricane Katrina relief. Although two commentaries by private sector personnel related to Katrina met the initial screening criteria, they did not meet the inclusion criteria after full review.[70,71] If the Journal of Military Medicine had not published a supplemental edition in October 2006 dedicated to

* References 20,21,23-30,33-36,38-40,42,43,45-54,56,58,59,61,63
† References 22,31,32,37,41,44,55,60,62
‡ References 20,21,23-30,33-36,38-40,42,43,46,48,50-54,56,58,59
§ References 31,32,41,45,47,49,55,60,62
** References 20-22,25,27-33,35,38,40-42,44,45,47-49,51,54,55,58,60-63
†† References 23,26,34,36,37,39,46,50,52,53,56
‡‡ References 20,22,25,30,32,38,40-42,44,45,47,49,51,55,62,63
§§ References 21,27-29,31,33,35,48,54,58,60,61
*** References 23,36,37,39,46,52,53,56
††† References 21-24,26-28,30-36,38-43,45-54,56,58,60,61,63
‡‡‡ References 21-24,26-32,34-41,43-46,48-62
§§§ References 21,22,26-33,35,36,38-42,44-47,49-53,55-58,60,62,63

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Variable	n (%)	Variable	n (%)
Country of Origin		**Actual Mission**	
US	42 (97.7)	Continuing Promise/Partnership for the Americas	2 (4.7)
Non-US	1 (2.3)	Pacific Partnership	8 (18.6)
Type of Publication		Operation Unified Assistance (Tsunami Relief)	17 (39.5)
Journal	43 (100)	Operation Unified Response (Earthquake Relief)	12 (27.9)
Book	0 (0)	Katrina Response	0 (0)
Book Chapter	0 (0)	All	4 (9.3)
Dissertation/Thesis	0 (0)	**Primary Focus Area**	
Conference Proceedings	0 (0)	Exercise/training	2 (4.7)
Other	0 (0)	Medical Care	35 (81.4)
First Author Affiliation		Dental Care	0 (0)
Public	34 (79.0)	Veterinary Care	0 (0)
Private	9 (20.9)	Partnership/Collaboration	4 (9.3)
Sector		Other	2 (4.7)
Health (non-military)	9 (20.9)	**Research Methodology**	
Military	30 (69.8)	Quantitative	5 (11.6)
Diplomacy	0 (0)	Qualitative	1 (2.3)
Development	0 (0)	Mixed Methods	0 (0)
Profit	0 (0)	Descriptive	31 (72.1)
Not for Profit	4 (9.3)	Other	6 (14.0)
Mission Type		**Detailed Methodology**	
Humanitarian Assistance	11 (25.6)	Experimental	0 (0)
Disaster Response	29 (67.4)	Non-experimental	5 (11.6)
Both	3 (7.0)	Quasi-experimental	0 (0)
		Narrative	0 (0)
		Phenomenology	0 (0)
		Grounded Theory	1 (2.3)
		Ethnography	0 (0)
		Case Study	1 (2.3)
		Other	36 (83.7)

Table 2. Descriptive Statistics

Operation Unified Assistance, 11 of the 17 publications meeting inclusion criteria and coded under disaster response would not be included in the analysis. If these articles were excluded from the analysis, the specific mission with the greatest proportion of publications would shift from Operation Unified Assistance now with six (21.4%) to Operation Unified Response with 12 (42.9%).

Sector by Mission Type—First authors representing the health, military, and not-for-profit sectors overwhelmingly published on disaster response. Nine (100%) publications by health sector (non-military) authors focused on disaster response, three (75.0%) from the not-for-profit sector, and 17 (56.7%) from the military sector. None of the health sector publications focused on

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	Specific Hospital Ship Mission n (%)				General Mission Type n (%)				
	Total (n)	Continuing Promise	Pacific Partnership	Operation Unified Assistance	Operation Unified Response	All Missions	Humanitarian Assistance	Disaster Response	Both
Author Affiliation									
Public	34	2 (5.9)	7 (20.6)	11 (32.4)	10 (29.4)	4 (11.8)	10 (29.4)	21 (61.8)	2 (8.8)
Private	9	0 (0)	1 (11.1)	6 (66.7)	2 (22.2)	0 (0)	1 (11.1)	8 (88.9)	0 (0)
Sector									
Health (non-military)	9	0 (0)	0 (0)	7 (77.8)	2 (22.2)	0 (0)	0 (0)	9 (100)	0 (0)
Military	30	2 (6.7)	7 (23.3)	8 (26.7)	9 (30)	4 (13.3)	10 (33.3)	17 (56.7)	3 (10)
Diplomacy	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Development	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Profit	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Not for Profit	4	0 (0)	1 (25)	2 (50)	1 (25)	0 (0)	1 (25)	3 (75)	0 (0)
Primary Focus Area									
Exercise/training	2	0 (0)	0 (0)	2 (100)	0 (0)	0 (0)	0 (0)	2 (100)	0 (0)
Medical Care	35	2 (5.7)	7 (20)	12 (34.3)	11 (31.4)	3 (8.6)	10 (28.6)	23 (65.7)	2 (5.7)
Dental Care	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Veterinary Care	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Partnership	4	0 (0)	1 (25)	3 (75)	0 (0)	0 (0)	1 (25)	3 (75)	0 (0)
Other	2	0 (0)	0 (0)	0 (0)	1 (50)	1 (50)	0 (0)	1 (50)	1 (50)
Research Methodology									
Quantitative	5	1 (20)	0 (0)	1 (20)	2 (40)	1 (20)	1 (20)	3 (60)	1 (20)
Qualitative	1	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)
Mixed Methods	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Descriptive	31	1 (3.2)	6 (19.4)	15 (48.3)	8 (25.8)	1 (3.2)	8 (25.8)	23 (74.2)	0 (0)
Other	6	0 (0)	2 (33.3)	0 (0)	2 (33.3)	2 (33.3)	2 (33.3)	2 (33.3)	2 (33.3)
Detailed Methodology									
Experimental	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Non-experimental	5	1 (20)	0 (0)	1 (20)	2 (40)	1 (20)	1 (20)	3 (60)	1 (20)
Quasi-experimental	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Narrative	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Phenomenology	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Grounded Theory	1	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)
Ethnography	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Case Study	1	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)
Other	36	1 (2.8)	8 (22.2)	14 (38.9)	10 (27.8)	3 (8.3)	10 (27.8)	24 (66.7)	2 (5.6)

Table 3. Bivariate Analysis of Major Domains

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humanitarian assistance missions, and only three (33.3%) from the military and one (25.0%) from the not-for-profit sectors. No publications from the diplomatic, development, or profit sectors were identified in the systematic review. Recognizing hospital ships are leveraged by the US government to provide "health diplomacy," this literature shortfall is surprising. This is especially so when a key objective of hospital ship missions is to increase collaboration among interagency partners such as the DoD, DoS, and USAID.

Primary Focus Area by Mission Type—Twenty-three (65.6%) publications focusing on medical care, two (100%) exercises/training, and three (75%) partnerships/collaboration fell into the disaster response domain. The disaster response medical care publications were evenly split between Operations Unified Assistance and Unified Response (12/23 (52.2%) vs 11/23 (47.8%)). The remaining medical care publications focusing on humanitarian assistance missions disproportionately related to Pacific Partnership compared to Continuing Promise (7/9 (77.8%) vs 2/9 (22.2%)). Three (75%) publications focusing on partnerships described Operation Unified Assistance, while one (25%) described Pacific Partnership. This finding is not surprising as three of the partnership publications originated from the Journal of Military Medicine supplemental. No publications related to dental or veterinarian care were identified. Although dental and veterinarian services provided during hospital ship humanitarian assistance missions feature prominently in mission output statistics and press releases, the dearth of literature from these professions is concerning.

Research Method by Mission Type—When considering research methodology, only five (11.6%) sources meeting the inclusion criteria used quantitative analysis. Of these, three (60%) were related to disaster response, while two (40%) were split between humanitarian assistance and "both" domains. The only qualitative study fit the disaster response domain and the Operation Unified Assistance mission. Another way to view these findings is to simply state six empirical publications related to Navy hospital ship missions were identified, an average of two publications per disaster response (4/2) and 0.2 (1/6) per humanitarian assistance mission. This shocking deficit in empirical studies related to hospital ship missions highlights a potential void in measures of effectiveness related to process and performance.

Detailed Research Methodology by Mission Type—A more detailed analysis of research methodology finds all five of the quantitative publications were non-experimental. The authors did not explicitly design a quantitative non-experimental research study to assess correlation or compare multiple variables in a cross-sectional or longitudinal manner. Rather, each of these publications described their quantitative analysis of data collected during individual or multiple missions. Three (60%) focused on disaster response while two (40%) focused on humanitarian assistance and "both" domains. The qualitative grounded theory and case study focused on disaster response and related to Operation Unified Assistance. Thirty-one (72.1%) publications simply described individual experiences; 24 (74.2%) focused on disaster response. No experimental or quasi-experimental quantitative studies nor narrative, phenomenology, or ethnographic qualitative studies were identified.

Discussion

How and why US Navy hospital ships deploy has changed dramatically since the 2004 Asian tsunami. This systematic literature review informs the DoD and partner organizations how each other and the broader international community characterize hospital ship missions. The three most significant findings of this research are: (1) the dearth of hospital ship empirical studies; (2) the scant number of sources describing partnership impact; and (3) the complete absence of diplomatic, development, and host nation primary author sources. Other findings such as only one publication from partner nation participants (United Kingdom), the paucity of private sector literature, the low proportion of private sector humanitarian assistance publications, and the absence of sources focused on the *Comfort* response to Hurricane Katrina should not be dismissed. Overall, this study reinforces the criticism regarding the need for DoD to more effectively measure humanitarian assistance mission impact.

Near-term efforts should focus on identifying and synchronizing existing research capabilities to fill these identified literature gaps. Leveraging internal DoD organizations such as the Center for Naval Analysis and the Office of Naval Research to design empirical research studies in conjunction with other hospital ship partners should be supported. Collaboration among these internal DoD organizations and external partners (eg, the Department of State, US Agency for International Development, NGOs, and host nation Ministries of Health) who maintain expertise in monitoring and evaluation and have long histories of development program evaluation must be fortified.

Long-term efforts should leverage these research collaborations and the findings of this study to objectively explore the effectiveness of Navy hospital ship missions in building regional partnerships and meeting the humanitarian and disaster response needs of a host nation population. Although patient output numbers during hospital ship missions are large and other projects completed perceived effective by mission participants (eg, distributing eyeglasses and public health classes provided to indigenous populations), their impact on strengthening partnerships or achieving the National Military Strategy objective of strengthening international and regional security is unknown.

Findings of these collaborative research efforts should be published to inform key stakeholders and the international community of the impact of hospital ships. Incentivizing or requiring partners to formally document their contributions should be pursued. Conducting rigorous scientific research of Navy hospital ship mission impact commensurate with what is currently employed by the DoD in maintaining the health of service members and beneficiaries is realistic and achievable.

Furthermore, the Gothenburg consensus paper established health impact assessment (HIA) as a methodology recognized by the World Health Organization to assess whether basic values are met in health and policy agendas.[72] Values governing HIA are "democracy, equity, sustainable development and ethical use of evidence," and are used to both inform decision makers and maximize positive and minimize negative health impacts. Kickbusch and Erk (2009) suggest health policies that align national interests with the diplomatic, epidemiological and ethical realities of a globalized world are more likely to protect and promote global health.[73] Unfortunately, the US, China, and most other countries have not met the minimum HIA standards in similar health-related missions.[74]

Conclusion

It is important to keep in mind that although global health influences foreign policy; it is the latter that drives the prioritization of efforts in the health diplomacy arena.[75] Unfortunately, the lack of a clear definition for US government health diplomacy has obscured objectives and responsibilities among different departments and agencies. As a result, politicians continue to leverage health services provided by Navy hospital ships to meet official government diplomacy efforts. Ironically, using hospital ships to meet political objectives may in fact undermine and place a heavier burden upon health efforts managed by the development community. Notwithstanding this possibility, the recurring deployment of US Navy hospital ships in support of humanitarian assistance missions is perceived as a key pillar of US government health diplomacy.

Although hospital ship missions conducted in conjunction with partner nations, host nations, and NGOs are designed in part to increase the ability of all participants to effectively respond during times of crisis, objective analysis of this partnership is clearly lacking. Part 2 of this research effort will explore how and why U.S. Navy hospital ships influence partnerships among participants. It is important to design and implement rigorous studies to measure this impact given the increased use of hospital ships by the Department of Defense and the US Government to bridge the gulf with the humanitarian community and strengthen these partnerships.

Without rigorous research methods yielding valid and reliable information pertaining to Navy hospital ship missions, policy makers are left with anecdotal reports to influence their decision making process. Eliminating the military sectors role in humanitarian assistance is not being suggested; rather measuring the impact and comparative advantage of the military as well as focusing efforts where required by international agreements such as the Geneva Conventions may be a more appropriate investment. Now is the time in this era of global fiscal constraints and a shift toward international partnerships for actors participating in hospital ship missions to objectively measure their true impact. The participants and beneficiaries of services provided as a result of these missions deserve nothing less.

Disclaimer

The views expressed in this article are those of the author and do not reflect the official policies or positions of the Department of the Army, Department of Defense, or the US Government.

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