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The Hierarchy of Research Evidence: A Time for Change

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Abstract

Researchers have moved away from valuing research based on appropriate methodological rigor to using a Hierarchy of Research Evidence (HRE) scale. Over the past 20 years, nursing has seen a host of hierarchy variations describing what is considered more to less rigorous research evidence. The use of HREs is confusing at a minimum and may even be inaccurate information that would not serve nursing students today or in the future. The novice or expert researcher might not find a hierarchy model that supports their current research study, as there are many methods not included in any HRE model. In addition, the variances in hierarchy models leads to legitimate disagreements over what is being published in the HREs today. A review of 18 versions of a Hierarchy of Research Evidence is examined over an 18-year period (2002-2021). HRE vary from three to twelve levels with most settling for seven. A critical analysis of the similarities and differences are presented. The author proposes potential struggles for developing an evidence-based practice that is considered credible if we continue to use the HREs to represent strong or weak evidence. Almost all recent nursing research from doctorate programs would not rise above the lower levels, which is considered weak evidence regardless of which HRE is being used.

Introduction

The idea that research methods can be structured in a hierarchy from best to least useful evidence, is a relatively new idea. Nursing research textbooks discuss certain research as better research and most nursing authors present models depicting a Hierarchy of Research Evidence (HRE) that looks like a pyramid. This investigation identifies the HRE trend beginning around 2002, [1-3]. A review of Burns and Grove [4-6], Gillis and Jackson [7], and Polit and Beck [8] did not discuss HREs within their nursing texts. However, the discussion of HRE in nursing research textbooks began around 2004 [9,10] and became a permanent construct in nursing textbook's content maps [9-25]. This systematic review suggests the last 20 years has a documented acceptance of nursing research authors creating a linear progression that moves from least to best valuable research methods within their publications.

One might assume that all nursing students who have graduated from a baccalaureate or master's nursing program in the last 20 years have had exposure to the Hierarchy of Research Evidence (HRE) models and therefore leaving a mark in all such graduates that shapes their research thinking. It is the thesis of this paper to examine what is imbedded in the HRE and where the models fail the future of nursing practice by how they label the value of nursing research.

Examination of Hierarchy Descriptions

In (Table 1), there is a partial timeline of variations related to research hierarchies by various authors from 2002 to 2021. This paper will only explore a few of the possible issues that are present in (Table 1) and will focus on common definitions, disagreements, and what is missing in the world of nursing research. The sampling is a convenience sample by various authors used and known by this investigator but appears to provide a good overview of most HRE models. In addition, an examination of recent nursing research is assessed using HREs to determine if these models accurately support current nursing research projects in nursing doctorate programs.

Unique Variations and what is Most Rigorous?

The highest level of research has remained fairly consistent since its inception. Most authors place Systematic Reviews of Random Control Trials (RCTs) and / or a Meta-Analysis in the top tier (Table 1). All systematic reviews are defined as being quantitative research, which statistically integrates specific intervention. In most cases, the authors mandate this to be a systematic review of random controlled trials (RCTs), (11,14-16,18-21,25). There were a few outlier models that also place evidence-based practice guidelines [25] and a decision support systems [17,24] on the hierarchies. Grove, et al. [14] are the only authors to integrate blended and mixed designs at level eight of twelve, which was later dropped by these authors [15]. The absence of such critical research makes one wonder how this elimination came about.

Of significance is the text by Polit and Beck [26] that continued to resist the movement to put a hierarchy model into their work but rather stating, "Increasingly there are discussions of evidence hierarchies that acknowledge that certain types of evidence and knowledge are superior to others". By 2008, Polit and Beck had a traditional hierarchy model using seven levels modeling the most common hierarchy thinking.

Houser [16] was the only text reviewed that included the qualitative meta-syntheses in its top tier making a strong statement for qualitative methods. This suggests some divergence or resistance to the traditionally accepted idea of what is best research giving some increased value to qualitative inquiry. By 2018, Houser moved back to the traditional seven-level model with traditional hierarchy thinking for each level.

2021	2021	2019	2018	2015	2014	2014	2013	2012	2009	2009	2006	2005	2005	2002	2002	Level
Systematic reviews or meta-analysis of RCTs	Systematic reviews or meta-analyses	Systematic Review or Meta-analysis of all relevant RCTs.	Systematic Review or Meta-analysis of RCTs.	Systems	Meta-analyses of RCTs.	Systematic Review or Meta-analysis of RCTs.	Systematic Review of RCTs.	a. Multiple RCTs as meta-analysis, or systematic Review or meta-synthes is with Consistent interventions; b. RCTs with large sample or effect size	Meta-analysis, or systematic reviews or RCTs, practice guidelines developed by systematic review of RCTs	Systematic Review of RCTs.	Systems	Meta-analysis, or systematic reviews or RCTs, Single RCT	Meta-analysis, or systematic reviews or RCTs, practice guidelines developed by systematic review of RCTs	Meta-analysis, or systematic reviews or RCTs; a. is very low bias, b. level is low bias, and c. level is high bias	Meta-analysis, or systematic reviews of RCTs,	1
Randomized Control studies (RCTs)	Randomized Control studies (RCTs) or experimental studies	Evidence obtained from well-designed RCTs	RCTs	Summaries	Experimental RCT	Well-designed RCT	Meta-analyses of RCTs & Quasi-exp.	RCTs or quasi-exp. Studies with consistent support for a spec. intervention	Single RCT	Single RCT	Summaries	Single well controlled study without randomization, Single quasi-exp.	Single RCT	Systematic review of case control and cohort studies; a. is very low bias, b. level is low bias, and c. level is high bias	Single RCT	2
Non-randomized studies (Quasi-Exp)	Mixed methods, systematic review and qualitative meta-syntheses	evidence obtained from well-designed controlled trials without randomization	Quasi-Experimental studies	Synopses of Syntheses	Quasi-Exp. (not randomized, or no control group)	Quasi-Exp	Integrative reviews of RCTs & Quasi-exp.	Evidence from intact groups, b. Ex-post-facto and causal-comparative; c. Case-control or Cohort studies; d. time-series with or without intervention; e. single exp. Or quasi-exp. with high effect size.	multiple well controlled study without randomization--quasi-exp.	Systematic review of Correlational or observational study	Synopses	Non exper., descriptive, comparative, correlational, or case study.	Multiple well controlled study without randomization--quasi-exp.	Non analytical studies (case reports or case series	Quasi-exp.	3

Systematic reviews of non-experimental (observational) studies	Descriptive correlational, predictive correlational, cohort studies	Evidence from case control and cohort studies	Non-experimental studies	Syntheses	Well-designed non-experimental design	Single, non-expl. Case-control, correlational, cohort study	Single RCT	Integrative reviews, systematic reviews of qualitative or descriptive, theory based evidence, expert opinion, peer reviewed prof. organizations with supporting clinical evidence.	Case control and cohort studies	Single correlational or observational	Synthesis, Briggs Reviews, Cochrane,	expert panel, opinions, clinical practice by authorities	Case control and cohort studies	Expert opinion	Case Control study	4
Non-experimental /observational studies	Descriptive study, qualitative study	Systematic review of descriptive or qualitative studies	meta-syntheses	Synopses of single studies	Case report, clinical expertise, expert opinion	Systematic Reviews of Descriptive, Qualitative	Single Quasi-exp.	Systematic review of descriptive or qualitative studies	Systematic review of descriptive or qualitative studies	Systematic review of descriptive or qualitative or physiologic studies	RCT Studies		Systematic review of descriptive or qualitative studies		Systematic review of descriptive or qualitative studies	5
Systematic review / meta-syntheses of qualitative studies	Opinions of expert committees and authorities	Single descriptive or qualitative study	Qualitative studies	Single Studies		Single descriptive or qualitative	Meta-analyses of correlational studies	Single descriptive or qualitative study		Single descriptive, qualitative, or physiologic study	Other types of Exp. Studies : Solomon, Multiple exp. Groups, crossover.		Single descriptive or qualitative study		Single descriptive or qualitative study	6
Qualitative and Descriptive studies	Opinions of authorities, expert panel	Opinions of experts and authorities. Expert committee reports, or organizations based on research				Opinion, Authorities, expert panel	integrative review of correlational or descriptive	Opinions of authorities, expert panel		Opinions of authorities, expert panel	Quasi-exp., time series,		Opinions of authorities, expert panel, regulatory opinion		Opinions of authorities, expert panel	7
Non-research sources, e.g. internal evidence, expert opinion							mixed methods & systematic review of quantitative, qualitative or mixed designs				Non-Exp. Designs, descriptive, Correlational					8

							Qualitative Meta-synthes is				Qualita tive System atic Revie ws or meta synthes is					9
							Single Correla tional				Single Qualita tive study					10
							Single qualitat ive, dexript ive				Expert Opinio n, Case study, practic e guideli nes, progra m outcom e data, narrati ve review s					11
							Opinio n of authori ties with clinical eviden ce, reports, expert panel									12
2021: Polit and Beck	2021: Burns and Grove	2019, Melnyk & Fineout - Overhol d	2018, Houser	2015: Schmi dt, Brown	2014: Boswel l, Cannon	2014: LoBio ndo- Wood, Haber	2013: Grove, Burns, Gray	2012: Houser	2009: Oncolog y Nursing Society	2009: Mateo, Kirchhoff	2012: Schmi dt, Brown (adopte d from Haynes , 2006)	2005: RANO. MGC/or g Four Tier Method	2005: Melnyk, Fineout- Overhol t	2002: New Zeala nd Group	2002: modif ied from Guyat t, Renni e by AMA	Aut hors
Authors & Year of Evidence																

Table 1: Intrgration of Evidence of Research designs-b.

What is Least Rigorous?

Examining the lower tier of HRE’s is more complex as there are significant variations on how many levels are used by various authors. They range from three to twelve levels, which are broken down in various ways that may be more general or very specific. The bottom tier, therefore, may also be more general or very specific based on the various author’s interpretation. Those authors who have 3-5 levels in their hierarchies [3,11] identify case reports, clinical expertise, expert panel, or expert opinion as the lowest level of research.

For those hierarchies having 6-12 levels, [10,12-16,18-21,24-26] there is a continuation of the lowest levels having the same concepts that were found in smaller hierarchies; case reports, expert panel, expert committee, or expert opinion. In addition to these four descriptors of evidence in Schmidt and Brown [24] eleven-tier hierarchy with the addition of practice guidelines, program outcome data, and narrative reviews. Schmidt and Brown suggest all quality projects are to be placed in the bottom tier in their 2012 model. In 2015, Schmidt and Brown changed to a seven-tier model and dropped expert panel leaving only reports, expert committees, or expert opinion, which would fall in line with other seven-tier models [18,21]. Schmidt and Brown [25] also dropped outcome studies from their previous 2012 version, which left all recent models reviewed without outcome studies at any level. Again, this leaves a large void for those researchers who use outcome research as a method.

The bottom tier is subjective opinion or experience and would not meet the definition of research in any textbook. However, they are a part of the definition of evidence-based practice (EBP) found in various research texts and originally defined by Sacket, et al. [27]. EBP has been defined as an integrated triad of; best scientific research, the patient’s perception of value, and expert clinical experience. Two parts of the EBP triad are not research and have some language that is seen on the lowest tiers of all HREs.

What HRE Models do not mention

What is not mentioned specifically or within a generalized statement within most hierarchies, is the research that is labeled as historical, action, intervention, outcome (after 2015), blended-mixed (reoccurred in 12), translational, constructionist, or Big Data. HRE leave all the researchers using such methods in confusion about value. In addition, there is no rationale for doing so. It leaves some critical issues missing from the assessment of research hierarchies causing theoretical confusion about the entire process. What does it mean to value hierarchy models when we read, “There has been a major shift in publishing nursing studies as the number of studies using traditional quantitative or qualitative methods is dwarfed by the number of outcome studies,” [14]? The use of outcome, intervention, mixed method, descriptive methods, and translational research is greatly impacting nursing practice today. Does this mean these methods are poor methodologies to be used for changing practice? Why is non-research knowledge being placed at the bottom tier of HRE? The idea of HRE’s should challenge our thinking regarding their value, purpose, and usefulness for students.

It is possible to examine various reasons why many types of research are not discussed using hierarchy models. It could be as simple as editorial bias for valuing the RCT, or as complex as a hidden agenda going back to the debate of positivistic inquiry versus constructionist (naturalistic) inquiry, which started at the beginning of the 20th century. This systematic review identifies several serious problems with using any HRE model to describe the value of any research method, especially in practice and clinical professions like nursing.

Recent Nursing Practice Research

The Doctor of Nursing practice (DNP) is a relatively new idea and was not originally meant to be a research degree [28]. However, it is considered a terminal degree and many programs require some level of research to complete the program during their capstone experience. Although the controversy exists as to what type of capstone project should be conducted by DNP students, we continue to see research capstone projects being produced even though the AACN [29] stated, DNP practice-scholarship is demonstrated when the principles of nursing scholarship are combined with the eight DNP Essentials to produce a graduate prepared to improve health and care outcomes. The integration of these new or refined skills improves outcomes through organizational /systems leadership, quality improvement processes, and translation of evidence into practice, among other ways, (p. 2).

AACN is suggesting the DNP is not doing research, but still leaves it open by using the term, “improve health and care outcomes,... translation of evidence, ...[and] among other ways”(p. 2) and one might see strong support for DNPs to advance practice by doing some form of scientific inquiry. In addition, many DNP projects are required to go through an Institutional Review Board (IRB), which is required of research and not quality projects.

The Ph.D. or similar nursing doctorates cannot keep up with the growth of the DNP programs that have now reached well over 303 programs accepting applicants compared to 133 research doctorate programs. The DNP, from 2015 to 2016, had admission growth from 21,995 to 25,289 with research doctorates hovering in the 5200 range [29]. Although there may be confusion regarding the DNP research role, capstone projects continue to produce evidence for practice and it is shaping the nursing research agenda, regardless of what it was intended to do. The question is; what are they researching and what methods are they using?

DNP Projects and Outcomes

An examination of previous DNP program research projects was reviewed to determine where they might be on the typical hierarchy of evidence models for this project. One publication included 115 DNP studies from 2007-2014 [30]. An analysis of these research titles and descriptors is presented in (Table 2).

Type of Study	Number
Quantitative Research	
RCT	1
Correlational	2
Qualitative Research	
literature reviews	2
perceptual studies	5
Experience Descriptive	53
Evaluation Descriptive	35
Combination Studies	
Intervention Outcomes	17
Total Studies	115

Table 2: 2007-2014 DNP studies.

The second document was from Vanderbilt [31] where they published their 2016 DNP project titles and there is a continuation of similar themes as in (Table 2). The Vanderbilt group of studies were evaluated and presented in (Table 3).

Type of Study	Number
Quantitative Research	
RCT	0
Correlational	0
Qualitative Research	
literature reviews	0
perceptual studies	5
Experience Descriptive	14
Evaluation Descriptive	15
Combination Studies	
Intervention Outcomes	4
Total Studies	38

Table 3: Vanderbilt- 2016 DNP studies.

What is obvious by the topic distributions presented in (Tables 2,3), is a focus on conducting research at the lower levels of any hierarchy model. The titles indicate lower levels of research or is considered low level evidence and matches the lowest tier related to opinion and experience, which has been challenged as not being research, but is a part of the evidence-based triad. If the reader believes the DNP studies are not actually improving practice, then the hierarchy models may be accurate in calling these studies as low-level evidence and minimally advancing practice. If the DNP projects and research is improving practice, then the idea of a hierarchy is misleading and supports the concerns presented in this paper—that is, hierarchies are confusing at best and may offer misleading understanding of nursing research for practice.

Ph.D. Dissertation Research

Many would argue that research should be coming from the Ph.D. (DNS, Ed.D.) and not the Doctor of Nursing practice (DNP) students. Strobehn, et al. [32] conducted a study where they removed all DNP studies and only looked at 101 nursing Ph.D. studies. They were examining the research priority areas and were able to examine all 101 methodologies as well. (Table 4) is a breakdown of their findings in terms of methodologies:

(Study does not explained how 101 becomes an N=112)

Quantitative Methods	
Correlational	20
Descriptive	16
Instrument design (quasi-exp)	1
Big Data	5
Retrospective	2
Desc. Correlational/ cross sectional	4
Exploratory cross sectional	1
Qualitative methods	
Case study	5
Grounded Theory	4
Phenomenology	9
Hermeneutic	2
Small/ basic /generic	5
Descriptive	3
Not available, or unknown	19
Mixed method	
Convergent	11
Explanatory	2
Exploratory	2
Case study	1
Total cases	112

Table 4: 2021 Study on Ph.D. Dissertations.

As we examine the quantitative methods used, there are no methods in the top tiers but rather only identified in the lower levels along with the qualitative methods used. No study would go higher than the bottom three levels on a typical seven tier model with the most traditional labeling for each level. It is possible the one instrument design method would rise to the fourth level as a quasi-experimental design, but in general it can be said that Ph.D. studies do not use higher levels of research evidence. A second point identifies many methods not presented on the HRE models, suggesting a disconnect between HREs and the research being conducted.

According to all the studies reviewed, one might assume nursing is not really providing high level evidence for practice changes and improved outcomes. If this idea is rejected, then another interpretation is necessary. Does current nursing inquiry method suggest the HRE are not adequate or appropriate for understanding advancements in nursing practice? Polit and Beck [23] have started making small movements to rethink the HRE. These authors have separate scales that are not hierarchal, but rather based on how easy one can find answers to clinical questions and call this the 6S method. Polit and Beck provide a poignant statement supporting this study:

Although evidence hierarchies are intended as an EBP resource, considerable confusion exists regarding levels of evidence scales. The fact that there are dozens from which to choose exacerbates this confusion. One important issue is seldom acknowledged is that different Types of questions require different hierarchies [methods]. p. 40.

Prior to 2004, nursing research textbooks provided little guidance except to match the question to the correct research method and to ensure using appropriate rigors for that method. Gillis and Jackson [7] suggest the decision to assist the reader in understanding the quality of published research is to be very clear on what constitutes evidence, and be as open about one's process, formulation, and analysis of the evidence. These past methods examining the quality of research became lost to the idea of a hierarchy of research evidence—a change that should have been challenged at the time. Now we are left with confusion and distrust of scientific inquiry.

Big Data-A Game Changer

The HRE models have yet to include Big Data, even though Ph.D. nursing researchers are using this method. Using Big Data is a relatively new form of research and could be labeled a disruptor to all former research thinking. Some have already presented major arguments to give up the Random Control Trial (RCT) as the perceived gold standard of inquiry. Big Data does not need sampling or a control, as they usually include the entire population. Big Data does not have an intervention and looks at the reality of what exists and then asks questions of the data. "Will RCT maintain its dominating position? The answer is No. It is expected that Big-data Clinical Trials (BCT) will reshape the profiles of clinical research, and BCT will take the place of RCT as the dominating research type," [33]. Gary King is the director of the Harvard Institute of Quantitative Social Science and states, "It's a revolution. We're really just getting under way. But the march of quantification made possible by enormous new sources of data, will sweep through academia, business and government. There is no area that is going to be untouched," [34]. It may be time to drop the hierarchy of evidence before we don't know how to address the fall of RCT from its prominent position.

Summary

In the past, research questions were matched to the best method that could offer a path to answering that question. Various research methods had a path starting with a philosophical underpinning that was either positivistic, constructionist (naturalistic), or blended, which has been described over the years in various ways [22,26,35]. Once the researcher knew what domain of thinking they were aligned with, the method for evaluating the question was identified and the appropriate research rigors for that study were presented in the methodology section. Using the appropriate rigors for the method used, makes the research more rigorous. Researchers are beginning to realize the value of having huge amounts of data for an entire population. Big Data may change our view on what we consider most valid evidence in future practice, which cannot be answered using a HRE.

If we use our current history of nursing advancing practice with research, we must change our view of HRE and return to the idea that the question dictates the method. The rigor used in that method gives us our best evidence for practice outcomes. Be open to the idea that these hierarchy models are only a distraction to nursing practice and not a support, as this investigation suggests.

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