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Protecting the power of interventions through proper reporting

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Abstract

Authors, reviewers, and journal editors are responsible for ensuring that standards of research reporting include detailed descriptions of intervention. The impact of nursing intervention research is much reduced when interventions are poorly described. Nursing research reports often fail to detail descriptions of interventions sufficiently to move future research forward, apply new knowledge in practice, and refine theories. In order to address this deficit, the authors constructed detailed guidelines for reporting interventions. Based on a review of healthcare literature, these guidelines include a discussion of theoretical, participant, interventionist, content, and delivery intervention elements with rationale for their inclusion. Suggestions for presenting this information in limited journal space are also presented.

Introduction

The purpose of nursing research can be viewed as threefold: to increase empirical knowledge for practice, to inform future research, and to advance nursing theory.^{1,2} Empirical findings are vital for evidence-based nursing practice. Efficient scientific progress builds on previous study findings. Empirical findings may provide evidence which supports or refutes theoretical propositions. Because nursing is a practice discipline, intervention research is particularly valuable for improving patient outcomes.^{3,4} Research can identify specific nursing interventions or sets of interventions that result in improved patient health and well-being.^{3,5,6} Therefore, nursing intervention research is critical to developing nursing as a profession and to improving outcomes.

Researchers have a responsibility to both conduct valid research which demonstrates interventions' effects on patient outcomes and to disseminate findings.⁷ Although a research report may represent the culmination of a specific study, the published article becomes the foundation for knowledge construction and improved practice.⁸ However, nursing research reports often fail to describe interventions well enough to judge their validity and generalizability. Poorly described interventions hinder both further research studies and application in practice.⁵ This article provides guidance for completely describing

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interventions in research reports to facilitate efficient forward scientific progress and to provide empirical evidence for practice.

Intervention Descriptions in Published Research

Scholars from several healthcare fields have criticized inadequate reporting of interventions in their respective disciplines, including medicine^{9,10} and behavioral health.^{11–13} Nursing, with its particularly complex interventions, has similar problems.^{3,7,14–17} Conn et al.⁵ suggest that, because nursing is a relatively new scientific discipline, its researchers have emphasized methodological features that demonstrate scientific rigor to the comparative neglect of intervention detail. The Conn et al. analysis of 141 intervention research reports published in 27 journals during 2005 found that only 27% of the articles reported sufficient intervention detail for replication or use in practice.

Conn reported researchers devoted less than 10% of report space to intervention descriptions.⁵ Key details including intervention components, theoretical foundation of interventions, cultural relevance, setting, dose and frequency, and interventionist competency often are missing or unclear.⁵ Other subsequent reviews have demonstrated similar conclusions. Forbes⁷ examined 517 clinical intervention reports from three European nursing research journals and found inadequate and inconsistent intervention descriptions, including poor theoretical integration and categorization. McGilton et al.¹⁴ performed a systematic review of communication interventions in long-term care settings and discovered that inadequate descriptions of theoretical linkage, mode, duration, and even content, made it difficult to ascertain which intervention components contributed to beneficial patient outcomes. In a similar review of interventions in maternal-child home visiting, McNaughton¹⁵ found that most reports lacked intervention and theory linkages, McNaughton commented that the reports more thoroughly described client problems than the nursing interventions intended to address them.

It is critical to have understandable interventions in order to move future research forward, apply new knowledge in practice, and refine theories. Therefore, nurse researchers much reduce the impact of their intervention studies when they describe interventions poorly. Research reports lacking intervention detail inhibit investigators' capability to build on extant research, which hinders scientific progress.⁵ Complete descriptions are essential for pilot projects, efficacy research, effectiveness studies, and comparative effectiveness research because subsequent phases of research build on previous projects. Detailed intervention reporting is important regardless of the study outcomes because future researchers need information about both effective and ineffective interventions. When intervention descriptions are inadequate, researchers are unable to replicate effective interventions, to avoid duplicating ineffective interventions, or to effectively modify interventions. For example, researchers may inadvertently test ineffective interventions which are nearly identical to previously tested interventions because the interventions were inadequately described in reports. Given scarce resources for intervention research, science can most efficiently develop when information about both effective and ineffective interventions is available.

Sufficient intervention description is necessary to move the field forward through synthesis of knowledge via meta-analysis and systematic reviews.^{5,6,12,13,18} Meta-analysis moderator analyses statistically examine associations between intervention characteristics (e.g., content, dose) and outcome effect sizes. These analyses can identify intervention attributes linked with better or worse outcomes across multiple primary studies. Poorly described interventions hamper effective moderator analyses because intervention characteristics remain uncertain. To efficiently build scientific knowledge, complete descriptions are

essential for both studies with positive outcomes and for studies where interventions did not result in expected outcomes. Inadequate reporting of intervention descriptions among trials without expected outcomes prevents meta-analysts from identifying common characteristics of ineffective interventions.

Many interventions are designed according to theory-based predictions of what will effectively result in the desired outcomes. Thus interventions may provide direct or indirect evidence about theoretical propositions.² Successful theory-based interventions may provide some evidence to support theories. Complete descriptions of interventions among studies which did not achieve predicted outcomes are important because they may provide some evidence about lack of support for theoretical propositions. Because individual studies often have significant internal or external validity limitations, multiple intervention studies may become part of the body of evidence regarding utility of theories. Scholars struggle to advance theory when inadequately described interventions cloud interpretation of how interventions worked or why they were ineffective.^{7,11,12,19}

Finally, knowledge from intervention research provides the evidence for nursing practice.² Nurse clinicians cannot implement poorly described interventions. These descriptions are essential for providers to judge its appropriateness for their practice setting and population, as well as to replicate it in practice. Thus, the development of evidence-based practice requires clear intervention descriptions.^{5,9,16,18}

Current Guidance and Shortcomings

Health journals have historically managed the quality of research reports using peer review, author instructions, and editorial mechanisms.²⁰ In recent years, authors also have used reporting guidelines and taxonomies to shape their work.

Several groups have created reporting guidelines for particular types of studies. These are available on the Equator Network's website, equator-network.org.²¹ Of most relevance to nursing intervention reporting are the Consolidated Standards of Reporting Trials (CONSORT) statement for randomized controlled trials^{22,23} and the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) statement for behavioral and public health interventions.^{24,25} These guidelines, which deal with the entire research report are essentially checklists for clear and accurate presentation of research studies. They only briefly address intervention reporting. The CONSORT 25-point checklist includes a single point recommending reporting of "the interventions for each group with sufficient details to allow replication, including how and when they were actually administered."²⁶ TREND's 22-point checklist includes one point specific to interventions, recommends reporting "details of the interventions intended for each study condition and how and when they were actually administered," and lists specific elements of the intervention to address.²⁵ These checklists encompass the entire research report, and so their recommendations and descriptions regarding intervention content are necessarily incomplete.

Taxonomies are standard vocabularies including precise content definitions of intervention techniques.¹⁸ They provide a shorthand of sorts for reporting intervention content, which helps limit variability and make interventions directly comparable across studies.^{12,18} Attempts to classify interventions have been undertaken in areas including behavioral health,^{12,18} but are insufficient to explain the complexity of nursing interventions. The Nursing Interventions Classification (NIC) system, while specific to interventions that nurses perform, was not designed as a taxonomy for research interventions. Although NIC provides a standardized vocabulary, its lists of activities for each intervention have been designed to be modified according to nursing judgment and individual patient needs.²⁷ As a result, simply using a NIC label to describe a research intervention would not provide the

specific information needed to understand, evaluate, and replicate the intervention. Other nursing taxonomies have similar limitations for intervention research.⁴

Thus, although researchers increasingly write about the critical need for detailed intervention reporting, the field of nursing research still lacks guidance specific to complex intervention reporting. In order to address this deficit, the authors reviewed healthcare literature regarding intervention reporting and from these constructed detailed guidelines suitable for nursing researchers. The remainder of this article discusses intervention elements that researchers should report, how to report them, and how the nursing profession should evaluate them.

Intervention Reporting Recommendations

Five elements of an intervention should be described in a research report so that others may evaluate the evidence, use outcomes to design future research, refine theories, and apply the findings. The elements are: theoretical, participant, interventionist, content, and delivery elements of the intervention. These elements address the questions of why, who, what, how, where, when, and how much? We will discuss each element and offer practical suggestions for incorporating details into published reports. A summary of the essential intervention elements to report can be found in Table 1.

Essential Intervention Elements to Report

Theory—Explaining *why* a particular intervention (or set of interventions) was chosen and the mechanism by which it is thought to function creates a solid foundation for understanding it. Theory can make study findings meaningful beyond the specific study. Theoretical linkages support understanding the evidence presented.²⁸

In fact, Fawcett and her colleagues²⁸ call theory the point from which evaluation of evidence for practice should commence. In order to interpret the findings of intervention studies and judge their appropriateness for different settings, it is critical to have information about the how the interventions were developed conceptually (singly or in concert). Without theoretical linkage between interventions and their outcomes, readers are limited in their ability to judge the likelihood of a causal relationship. Nor can readers determine whether the observed relationships are meaningful outside of the study setting, because it is unknown whether the mechanisms involved transcend a single time and place.¹

Describing an intervention requires more than merely naming a theory. Authors should fully describe how the theory was implemented and whether it was implemented fully or partially. Any intervention components not derived from the theory should be mentioned along with the rationale for their inclusion. If the study measured theory-based mediating variables, their links to the theory should be explicit. Thus, we recommend that intervention research that uses a theoretical framework (a) explicitly identify the theory, (b) link intervention attributes to theoretical concepts, and (c) describe how the intervention (or interventions) functions to achieve the desired goals.^{3,7} However, post hoc application of theory to a pragmatically developed study is not recommended;^{2,25} these interventions should be identified as a theoretical or needs-based.

Intervention recipient—In addition to the traditional description of sample characteristics, authors should describe certain aspects of the participants as they relate to the intervention. The researcher may not consider the *receiver* of the intervention as part of the intervention *per se*. However, details about participants may have significantly influence the intervention's mechanisms of action and thus be necessary for replication.

Some nursing research delivers an intervention to health care providers (or family or informal caregivers) but assesses outcome variables in patients, who are the targets. Therefore nurse researchers should be clear regarding intervention targets and recipients.¹³

Intervention descriptions should specify whether the individuals or groups are present when researchers deliver an intervention.³ If a group is present, include its size²⁵ and the rationale for its formation (e.g., convenience, researcher-formed, existing family or work groups).³ Studies aimed at socially constructed groups such as workplaces or communities should carefully describe the cultural composition of the intended recipients. Interventions for work organizations should include detailed descriptions of the organizations that allow readers to fully understand the intervention target.

It is important to report any preparation of the recipients prior to delivering the intervention.³ Such preparation, though not necessarily dictated by a theoretical framework or measured through process outcomes, may affect the success of the interventions. Thus any physical preparation for clinical or biological procedures, as well as social or environmental preparation for interventions, should be described.

For studies including multiple treatment options, report participants' treatment preference at the time of consent (prior to treatment assignment). Including such information allows readers to evaluate a potential source of bias that may impact validity. Behavioral interventions are particularly subject to participant bias because outcome measurements are often subjective in nature, and thus may reflect the participant's opinion of the treatment as well as its effects.¹³

Finally, report incentives, compensation, and rewards given to intervention recipients.^{13,25} These could include monetary rewards for participating or completing a study, as well as assistance or reimbursement for the costs of participating (e.g., travel vouchers). Because these items influence successful adherence and completion of the study protocol, they influence the successful replication of the interventions.

Interventionist—The interventionist is the person *who delivers* the intervention to the recipients, and may include members of the study staff or other healthcare providers. Clearly identify and describe the interventionist, particularly their relationship (if any) to the recipients or recipients' community.^{10,13,25}

It is important to describe the interventionist's competence, or capability to successfully deliver the intervention and engage the recipients so that the desired outcomes may be reached.^{29,30} This competence directly influences both the intervention's outcomes and the fidelity of its delivery, and thus should be detailed in the research report. Include the interventionist's (a) professional credentials, such as discipline and education; (b) training specific to the intervention; (c) any relevant social characteristics; and (d) any preference toward one intervention over another in the case of comparative research.^{3,10,13} Describing interventionists and their competencies is necessary for successful replication of the intervention, for determination of any confounders or threats to validity, and for determining applicability to specific practice settings.^{29,31}

Intervention content—Certainly, in order to accurately replicate an intervention in either research or practice, it is essential to have a description its content. Intervention content includes the procedures, techniques, and materials delivered as the intervention(s).^{9,10,13} Broad terms, such as social support, need clear operational definitions. Systems-level interventions, such as changing the organization of care delivery, must be explained in detail because the meanings of commonly used phrases (e.g., case management) can vary widely.

Even content that may appear standardized at first glance, such as the content of diabetes self-care classes based on American Association of Diabetes Educators guidelines, must be specified because they can be implemented in diverse ways. Procedures should be described in sufficient detail that they can be replicated. For instance, simply stating that education was provided to participants would be inadequate; writers also must include descriptions of the education topics and materials.¹⁰ Authors should also indicate whether materials are available to the public or researchers, as well as how to obtain them.⁹

In nursing studies, complex interventions often are in some way tailored to individual subjects' characteristics or targeted to group attributes. Investigators should clearly indicate whether interventions were standardized or flexible, and to what degree.^{6,13} Interventions tailored to individual participant characteristics (e.g., perceived barriers to diet changes) or targeted to population subsets (e.g., gender) should be detailed, including decision points for different intervention pathways.^{3,10} By describing both the intended intervention content and what was actually delivered, investigators aid not only intervention replication, but also reader judgment of intervention fidelity and thus validity of the study.

Intervention delivery—After describing why an intervention was delivered, who delivered and received it, and what it entailed, turn the focus to how, where, when, and how much? These questions relate to the intervention's delivery, or implementation. Thoroughly describing the intended and actual intervention delivery allows readers to consider how implementation may have affected outcomes.⁶

Include the delivery mode, or *how* the intervention was delivered.^{3,10,13,25} For example, it is not enough to explain that participants received education regarding heart failure; writers also must detail the use of a telephone, home visit, or internet delivery system. Thus, if a failed education intervention was delivered via Internet or cellular phone to elderly participants, readers may consider whether the educational content or the delivery mode was at fault.

Include information regarding *where* and *when* the intervention was delivered, because this also may impact its success.^{3,10,13,25} Delivering an educational intervention post-operatively in a hospital versus one week later in the recipient's home may be associated with different levels of physical and emotional comfort, which could influence recipients' retention of the material and ultimately affect outcomes. Setting descriptions may require not only categorization (e.g., home or hospital), but also a physical and contextual characteristics (e.g., clean, quiet, private, of the participant's choosing, following their work shift, etc.).

In order to explain *how much* of the intervention was delivered, writers should describe recipients' exposure to the intervention and its intensity.^{3,9,10,13,15,25} Exposure refers to the amount (dosage) a recipient actually received, and intensity is a function of the dosage received over time.^{3,32} The intervention dosage includes the quantity delivered (amount), the number of times it was delivered (frequency), and the length of time during which it was delivered (duration).³² Report these details for each treatment group, particularly if the intervention is in any way flexible or adaptable. Such information is critical not only replicating a successful intervention, but also is necessary for subsequent research that aims to increase treatment efficacy.³¹

Finally, in order to use reported information about the intervention delivery process to evaluate outcomes, readers require information about the fidelity of the intervention delivery.^{10,13} Fidelity, also referred to as integrity, involves process outcomes – measurements of whether the intervention was delivered accurately, consistently, and according to plan.^{10,13,30,31} Fidelity suffers when intervention recipients do not receive

prescribed elements of the treatment protocol, and/or receive additional treatment elements outside of the protocol.¹³ Deviations from the intended intervention may result from interventionists' poor delivery, or from recipients' who modify treatments or fail to adhere to instructions.^{10,13} Regardless, readers need fidelity measurements to judge the validity of relationships between interventions and study outcomes.

Strategies for Reporting Interventions

The aforementioned details will allow readers to evaluate evidence and replicate the intervention through research or practice. However, it can be difficult to present this complex information in the limited space of a journal article. The following suggestions provide strategies to address this space challenge.

Presentation—When writing about complex interventions or sets of interventions, it is helpful to walk readers through the process from the participant's perspective, and to provide a procedural overview.³³ Narrative structure offers writers opportunities to incorporate setting and delivery details. This not only clarifies the sequence of events, but also allows for more detailed description of the preparation for and follow-up to the actual interventions. Complex interventions with multiple procedures and techniques may also benefit from graphical descriptions and timelines.⁹

Brevity and consistency—Avoid excessive description of published method elements, such as established instruments and standard statistical methods beyond what is necessary to evaluate the adequacy of research methods.⁵ However, do cite these primary sources and describe deviations from and adaptations to the elements that are unique to the study. Statistical methods and results should be adequately reported to evaluate validity. If standard intervention nomenclature and taxonomies are available with precise descriptions, use these terms freely and describe only the deviations.^{10,18} However, these are uncommon in the nursing discipline, and are less likely to be useful due to the complexity of nursing interventions and populations of interest.

Succinct writing skills can facilitate adequate manuscript space for complete intervention descriptions. Well-organized precise manuscripts are shorter than rambling papers. Writing to space limits is a more efficient and effective writing approach as compared to writing lengthier content and attempting to whittle to word requirements.³⁴ Synthesized reviews of extant research are shorter, and more powerful, than descriptions of individual studies. Other strategies for minimizing word count include using active rather than passive voice, avoiding complex sentences with multiple clauses, and minimizing adjectives and strings of propositions.³⁴ Selected content might be effectively and space-efficiently moved to tables or figures. Finally, professional editors and colleague peer reviewers may prune content to essential elements as unnecessary or redundant words, phrases, or complete sentences are deleted. Judicious use of these approaches may increase available space to fully describe interventions.

Locate intervention content outside research reports—One solution to the journal article space limits is to publish companion papers in the same journal, one article completely describing intervention details and the other reporting research methods and results. Because not all journals allow companion articles, authors should contact editorial offices prior to submitting linked manuscripts. Some journals are willing to publish a stand-alone manuscript with detailed descriptions of interventions, separate from a report of study results which may be published in the future or may have been previously published in that journal or another journal.⁵ Papers reporting distant follow-up findings after a primary article was published may direct readers to the previous paper where readers could find

detailed intervention information. These options are desirable because the information becomes permanently available for interested readers.

An alternative to ensure that thorough descriptions are available to readers is to provide supplemental materials. Some journals allow online supplements, which can include descriptions of interventions in greater detail than in print.^{5,10,13} It may be of particular use to publish procedural manuals or study protocols in this fashion.^{12,13} Another possibility is to make the materials available upon request from an author.^{5,13} This option is less desirable because investigators often lose access to materials over extended time periods or may exit careers making the content difficult to locate. Glasziou¹⁰ suggests creating an “intervention bank” linked to individual studies, which would include manuals, tools, and audiovisual materials. Links to these materials could be included in published reports. When using any online supplement, it is most important to make the material available over time,³ and to consider the degradation of web addresses, links, personal files, etc. Although requests for materials may peak soon after publication, content may be requested decades after studies are published.

Responsibility for Reporting Interventions

Nursing intervention research is critical for advancing the profession and improving patient outcomes. Thus, it is also critical to effectively communicate knowledge gained from research. Authors, reviewers, and journal editors are responsible for maintaining high standards of research reporting in order to achieve these goals.^{6,12}

Authors—To determine if their reports provide adequate intervention description, authors should ask, “Can this intervention be replicated on the basis of this report?” Authors can use Table 1 to determine if they have answered the questions of why, who, what, how, where, when, and how much. Preferably, a trusted colleague with limited knowledge of the study in question should assist in this evaluation. Authors should consider how they might work with journal editors to ensure that intervention details are available to readers either in print or online.

Reviewers—Journal manuscript reviewers should carefully evaluate the adequacy of intervention descriptions regardless of study phase or outcomes. Reviewers should ensure that sufficient details are provided and evaluate any other sources of information about the intervention. For example, if authors cite intervention details from another publication, the reviewer should examine it. Reviewers should also consider the amount of non-intervention methods content in the context of widely available information, as it may not need to be repeated in every publication. They may suggest condensing such content to allow more space of describing interventions.

Editors—Journal editors can contribute by publishing detailed standards they use to judge intervention reports, with a particular focus on determining whether interventions can be thoroughly understood and replicated.¹² Editors may need to negotiate the conflict between a reviewer’s insistence on more manuscript content about non-intervention methods and the need to provide adequate descriptions of interventions that build knowledge. Journal editors may work with publishers to make online supplemental material possible.

Conclusion

A research report can be a powerful piece of writing. Reports which provide detailed intervention descriptions can advance science, build evidence for practice, and create empirical information for theory development. Neglecting intervention details limits the

contribution of the research. To make the most meaningful contribution to the discipline and the patients and communities nurses serve, nurse researchers should adjust the focus of their reports to include detailed intervention descriptions.

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Table 1

Essential Intervention Content in Research Reports

Intervention Element	Description	Considerations
Theory	<i>Why</i> was a particular intervention (or set of interventions) chosen and what is the mechanism by which it is thought to function?	<ul style="list-style-type: none"> • Explicitly identify the theory • Link the intervention attributes to theoretical concepts • Describe how the intervention functions to achieve the desired goals
Intervention Recipient	<i>Who received</i> the intervention?	<ul style="list-style-type: none"> • Differentiate between the intervention target and recipient • Describe individual or group recipients • Describe their preparation • Indicate treatment preference • Describe incentives, compensation, and/or rewards
Interventionist	<i>Who delivered</i> the intervention to the recipients?	<ul style="list-style-type: none"> • Identify the interventionist and any relationship to the recipient • Identify personal characteristics specific to this project (e.g., ethnicity) • Describe their professional credentials • Identify specific intervention competence (e.g., training)
Intervention Content	<i>What</i> does the intervention entail?	<ul style="list-style-type: none"> • Provide clear operational descriptions • Describe procedures and materials in sufficient detail so that they can be replicated • Indicate how interventions were or could be targeted or tailored • Provide information about obtaining further intervention descriptions
Intervention Delivery	<i>How</i> was the intervention delivered? <i>Where</i> and <i>when</i> was the intervention delivered? <i>How much</i> of the intervention was delivered?	<ul style="list-style-type: none"> • Describe the delivery mode • Describe the physical and contextual setting • Describe the dosage of the intervention (amount, frequency, and duration), including both intended and administered dosage • Report on the fidelity of administration