Asion Journal of Research in Nursing and Health

Asian Journal of Research in Nursing and Health

3(3): 10-18, 2020; Article no.AJRNH.59065

Constraints to Effective Clinical Teaching and Assessment of Nursing Students' Competencies among Nurse Educators and Students in Lagos, Nigeria: A Qualitative Approach

Omotola Margaret, Oseni¹, Edith Chinonyelum, Ike^{1*}, Detu Adesuwa, Onwochei¹ and Njideka Judith, Esievo²

¹Department of Training Schools, Education, Research and Statistics, National Orthopaedic Hospital, Igbobi, Yaba, Lagos, Nigeria. ²Department of Nursing Sciences, Delta State University, Abraka, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Authors OMO and ECI conceived and designed the study wrote the protocol and the first draft of the manuscript. Authors ECI, OMO and DAO managed the FGD. Authors ECI, OMO and NJE managed the literature searches. All authors read and approved the final manuscript.

Article Information

Editor(s)

(1) Dr. Carla Maria Ferreira Guerreiro da Silva Mendes, Nurse Director at Centro Hospitalar de Setúbal, Portugal.

(1) Patcharin Sirasoonthorn, Naresuan University Phitsanulok, Thailand.
(2) Jithin Thomas Parel, Institute of Liver and Biliary Sciences (Deemed University), India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/59065

Original Research Article

Received 15 May 2020 Accepted 20 July 2020 Published 04 August 2020

ABSTRACT

Aim: This qualitative study explored the perception of nursing students and nurse educators on the constraints to effective clinical teaching and assessment of nursing students' competencies in two selected nursing schools in Lagos state.

Methods: Data was collected through a focus group discussion (FGD) among the population of interest utilizing a focus group discussion guide. The data generated from the FGD on the respondents' perception of the constraints were categorized based on the thematic analysis of the condensed views.

Results: The result revealed that both groups have similar understanding of what constraints to effective clinical teaching and assessment of nursing students' competencies means; the most

*Corresponding author: Email: edithike21@gmail.com;

profound constraints as identified by both study groups were; lack of knowledge of the clinical placement objectives by the students, clinical staff, nurse educators and assessors; subjectivity of the clinical assessment tools; lack of cordial relationship among staff; lack of instrument to practice real hands on procedures, and shortage of nurse educators, preceptors and clinical staff. The major effects of the identified constraints as recognized by both groups of respondents were; inadequate skill acquisition, display by the students lack of confidence to carry out procedures and feeling of inferiority complex among their peers from other discipline in the clinical setting. The perceived solutions by both study groups focused on setting and communication of clinical placement objectives, standardized evaluation tool tailored to assessing each skill acquisition, evidence-based and best practices in clinical teaching and assessment.

Conclusion: Considering the influence of nursing education on public health, identifying the constraints will help in restructuring and creating an authentic clinical teaching environment necessary for real 'hands-on clinical practice and for the perceive solutions to be effective, it requires supports and improvement upon by the training institutions, nursing students and nurse educators for competency development and sustainable benefits to the consumers of health care.

Keywords: Effective clinical teaching; clinical assessment; constraints; competencies; probable solutions; FGD.

1. INTRODUCTION

Clinical nursing teaching and assessment of competencies act as practice based education which depends on 'hands-on' experience learned in clinical environments [1]. This experience acts as a mediator to bridge the gap between theory and practice, and prepares nursing students for real-world situations [1]. Similarly, it was posited that clinical nursing teaching is the integration of knowledge and skills associated with patient care [2]. In this respect, clinical nurse educators and instructors are the most important and influential agents in clinical teaching and assessment of nursing students competencies. Hence, the success of a clinical education program depends on effective clinical instructors as they are in the best position to assess students' needs, identify opportunities. proper learning perform instructions and guidance, and conduct fair evaluations. Nurse educators are the key facilitators in the transformation of nursing students to the professional nursing role through effective clinical teaching and assessment of clinical competencies [3,4].

The researchers of this study have observed that nursing educators in these areas of study participate in training the students' to function in the clinical environment with the aim of education and training rather than evaluation of competencies and this may have contributed to the gaps existing in nursing theory and practice. Again as observed, some of the clinical teachings and sometimes assessment of clinical competencies of nursing students in the clinical area are carried out by available nurses on duty

who may not have had special training and experiences in clinical teaching, measurement and evaluation, such act may lead to inadequate instructions and evaluation. Students are also found in clinical areas practicing procedures with improvises without real hands on clinical procedures. Further, is the burning interest of Nursing and Midwifery Council of Nigeria (N&MCN) in recent time to produce nurses that can measure up at every level with their counterparts in medical field while caring for patients. There are speculations that there may be challenges and drawbacks to achieving effective clinical teaching and assessment of students' clinical competencies, and so the questions the researchers intend to find answers to are: What are the constraints to effective clinical teaching and assessment of nursing students' competencies? What are the perceived effects of these constraints? How could these be resolved? These informed the decision to undertake the study.

1.1 Significance of the Study

Identifying the constraints that impact effective clinical teaching and assessment of nursing students' competencies, will help nursing students and instructors to manage clinical learning situations in a more effective manner and provide evidences for the management of these institutions and similar institutions in developing guidelines for clinical practicum. It will also form the basis for equipping the training institutions and health facilities for better graduate output. In addition, based on literature search, there seems to be dearth of published

local studies for referencing. No published study could be identified on the qualitative approach on factors constraining effective clinical teaching and assessment of nursing students' competencies among students and nurse educators in south west Nigeria. As such the findings of the study will add to the existing knowledge, bridge the identified gaps and provide a reference for other researchers with interest in the problem or similar area.

2. METHODOLOGY

The study adopted a qualitative design with the case study approach using focus group discussion (FGD). The study was carried out in two Nursing schools in Lagos and the study population consisted of 11 Nurse Educators of school of post basic nursing studies National Orthopaedic Hospital, Lagos and were all female and 12 final year nursing students of School of Nursing, Lagos University Teaching Hospital made up of 9 females and 3 males. Being tertiary institutions the participants were from different socio-cultural background within the country.

Inclusion criteria:

- 1. Students must be in their final year
- Nurse educators must have partaken in clinical teaching and assessment of students for at least one year.
- 3. Educators must still be in service at the study setting during the period of the study.
- 4. Willingness to participate in the study.

Exclusion criteria

- Nursing students and educators in other schools other than the selected schools
- New students who have not had concentrated clinical practices
- 3. Nurse educators who were on leave at the time of the study.
- Newly employed educators who do not have up to one year clinical teaching and assessment experience.
- 5. Students and educators who were reluctant to participate

The study employed a simple random technique to select one school of nursing for the students' opinion and one post basic school of nursing for the educator's view for the Focus Group Discussion. The group of students and educators were chosen because they have had over six months to one year consolidated clinical teaching

and assessment exposure and could possibly give detail account of their clinical teaching, assessment and learning experiences.

Focus Group Discussion (FGD) guide was utilized as the survey instrument for collecting qualitative data. The FGD guide consisted of 5 open ended questions that sought to elicit responses from the participants on the meaning of constraints to both effective clinical teaching and assessment of competencies, the constraining factors, perceived effects of the constraints and probable solutions to the identified constraints. Two sections (Students and Educators) were held in each institution. A central venue, one of the students' classrooms was used for the discussions.

A moderator anchored the discussion while responses generated were recorded with both digital recorder and note taking by the co-authors who facilitated the sessions.

Questions that are related to the objectives of the study were posed to the participants to explore their opinion, feelings and experiences. Probing was utilized to generate detailed information and explanations to the research questions. Each session of the FGD lasted about 60 minutes and each participant was given equal opportunity to express their views. Five minute was allocated to the introduction section while 50 minute was allocated to the main discussion. Conclusion and questions were entertained for 5minutes. The researchers ensured minimal interference to the FGD guide but were attentive to sensitive issues raised. Recorded information was immediately transcribed verbatim after the end of the sessions.

The qualitative data analysis started by reading field notes and listening to tape recorded interviews. Questions and responses were coded into Themes from FGD and organized according to set objectives of the study. Remarkable and very important quotes from the subjects were noted and referenced in the discussion. The data collection was done in March 2019

The theory of integrated behavioral model which combines theory of reasoned action and theory of planned behavior was used to underpin this study. This theory presents new or changed determinants that affects intention to perform a behavior in an environment and these determinants include; experiential attitude, descriptive norms, personal agency and self-

efficacy. When there is an imbalance in these determinants it affects decision and intention to performed a planned behavior and in this situation constraints effective clinical teaching and assessments.

3. RESULTS

The qualitative analysis led to the emergence of five major themes based on the data generated from the students' and the nurse educators' points of view. The themes were considered important in eliciting the respondents' understanding of the meaning of constraining factors and the actual constraints to effective clinical teaching and assessment of nursing students' competencies and its perceived effects, as well as the probable solutions to the identified constraints.

3.1 Thematic Analysis

3.1.1 Theme 1: Meaning of constraints to effective clinical teaching by nursing students and educators

The nursing students and educators when asked what they understand as constraints to effective clinical teaching elicited diverse but related views:

Students' Views:

Constraints to effective clinical teaching means challenges and difficulties encountered by students and teachers during clinical teaching; like no time to teach students due to busy wards and limited staff on duty

Constraints are barriers that influence or restrict clinical teaching; it makes learning of procedures difficult.

They are problems that affect effective clinical teaching in the clinical area

Educators Views:

The educators had this to say "constraints to effective clinical teaching are factors impending effective clinical teaching and there are many of these factors, some coming from the school, others from the hospital of clinical placement and some others from both students and teachers and it hinders our passion to come to the clinical area to teach'.

Difficulties encountered in the clinical area while teaching the students, when as a teacher you do not have tools to work with making teaching uninteresting

3.1.2 Theme 2: Meaning of constraints to effective clinical assessment of nursing students' competencies

The participants when asked what they understand by constraints to effective clinical assessment of nursing students' competencies elicited the following responses:

Students Views:

Impediments in clinical assessment of nursing students

Hindrances encountered by students and educators in the clinical area while assessing students' clinical competencies

Factors that discourage effective clinical assessment of students' skills in carrying out procedures in clinical area

Educators Views:

Constraints to effective clinical assessment of nursing students' competencies are barriers to achieving effective clinical assessments of students' competencies

Things that will not make clinical assessment of students to occur adequately

Challenges or factors that hinder effective clinical evaluation of students' clinical skills

3.1.3 Theme 3: Perceived constraints to effective clinical teaching and assessment of nursing students' competencies

The result shows that the participants viewed constraints to effective clinical teaching and assessment of nursing students' competencies from different perspectives. This can be seen from the following excerpts:

Excerpts from the students:

Lack of clear objectives for each clinical posting and clinical instructors do not understand the concept and use of appraisal form for assessment of skills and the

appraisal form is not tailored to a particular posting objective to be acquired

We are assessed based on attendance to clinical posting rather than clinical skills set to acquired. There is Ineffective utilization of continuous assessment evaluation form to assess clinical knowledge and practical skills

Lack of instrument to practice with during clinical placement which make us to use improvise when we are in the ward and we do not carry out the real hands on procedures, sometimes procedures are explained without demonstration and during examination we become so afraid.

Shortage of clinical staff to teach the students and the use of ancillary staff to carry out some procedures, again is the lack of harmony and cordial relationship between clinical staff and educators from school, they always disagree.

Non-challant attitude of the students to work, lateness, absenteeism, non-participation in ward rounds, procedures and lack of disciplinary measures to airing students

Lack of accommodation for students and far distance to clinical area is a major challenge as some of us leave far from placement areas.

Excerpts from the educators:

Attitude of the students toward the program is low, some students display an attitude that they have just come to get the certificate and get promoted in their place of work without commitment to acquiring the necessary skills

Sometimes students are seen as part of the workforce to augment the nursing care carried out in the ward and are not taught but used as labour staff

We do not have committed clinical educators and the few committed ones have limited clinical knowledge and if told to carry out practical procedures in the ward, you see them shying away from it

Lack of clear, specific clinical objective and set goals to drive clinical placement and skills to be taught and assessed on the students for each clinical period, the students, educators, preceptors and assessors lack knowledge of clinical placement objectives

Lack of harmony between educators and the clinical preceptors and there is again too much workload on the educators and staff nurses

Sentiments in evaluating student by the evaluators maybe due to defective assessment tool

3.1.4 Theme 4: Perceived effects of the identified constraints

A further probe on how the identified constraints affect effective clinical teaching, assessment of competencies and students' skill acquisition elicited the following responses from the respondents:

Excerpts from the students:

Most times we forget to document procedures done even during examination because when we are on clinical posting the students carry out the procedure while someone else documents the procedure making us not to remember documentation of nursing care

Lack of specific objective for each clinical placement leads to lack of commitments by the students to acquire a particular skill during each posting and it develops in us fear and lack of confidence to practice even during examination because there is no direction and we are exposed to one thing at each posting. It looks so monotonous

Lack of real hands on practice of procedure with the right instrument due to lack of instrument leads to lack of harmonization of theory and practice, most times we memorize the procedures and do not practice procedures taught for better competency development

The application of some procedures like wound dressing by ancillary staff does not give the students the opportunity to learn as the ancillary staff does not teach the student nurses and we do not feel comfortable learning from them

Shortage of staff leads to use of students as labour staff rather than students who have

come to learn and nobody supervises the procedure carried out by the students and we continue to make mistakes

Far distance and lack of accommodation in the school and clinical placement areas leads to lateness, non-participation in nurses' handover and sometimes ward round and we know less of our patients

Excerpts from the educators:

An educator had this to say" am so much engrossed in setting exams and marking questions due to time allotted to it, so it hinders me from clinical teaching. No time to study manuals for clinical teaching, sometimes, the students are to read the practical manual without demonstration"

Improvising of equipment hinders teaching with actual instruments and materials and makes students not to learn real hands on procedures. It also discourages teaching

The students are not supervised as they should when on clinical placements as the nursing staff and preceptors are few and the wards are busy, so competencies are not evaluated frequently before students are exposed to major examination.

The available clinical assessment tool which is the appraisal form is faulty and not specific for specific task. This makes assessment very subjective and may lead to bias clinical assessment judgments.

Lack of cordial relationship between the educators, clinical preceptors and staff nurses, leads to seeing the educators as threat and disagree on opinions

Due to increase work load, the educators in the school have limited time to update themselves in practical procedures, hence, are not confident to go and give clinical teaching

3.1.5 Theme 5: Possible solutions to the identified constraints

The respondents when asked how the identified constraints could be solved responded:

Excerpts from the students:

There should be continuous assessment of students with a standardized evaluation tool

to test the skill to be acquired on each clinical placement based on set objectives before the main examination to ascertain competency

Elimination of improvising by providing materials and equipment for procedures by the management and training institutions to help students practice real hands-on procedures

There should be students-educators' clinical ward round such like practiced among doctors, and nursing students should be allowed to participate in medical ward round.

Nursing school should employ clinical instructors specifically for clinical teaching and assessment of students' competencies and avoid using clinical preceptors from the ward as they are overworked and do not have time for students; some of them are not committed and do not have the skills of teaching and assessment.

There should be availability of hostel accommodation for students within the training institutions and clinical area.

Periodic professional clinical examination should be encouraged for clinical staff for placement and promotion to improve knowledge and competencies.

Excerpts from the educators:

Clinical placement objectives should be set and communicated to students and clinical staff before sending students to clinical posting so as enable the students to be acquainted with possible competencies expected of them to acquire and work towards attaining the needed skill

Procedure manual should be reviewed to meet with current trend in practice and cover all placement objectives meant to be achieved

Nurses should working in harmony by exhibiting good work relationship between educators and clinical preceptors.

Increase of staff strength and employment of nurses that are very knowledgeable, and can think critically to help teach the student and promote role modeling.

4. DISCUSSION

The total number of respondents who participated in this in-depth interview and their views analysed was 23 (12 nursing students and 11 nurse educators). Majority 20(86.9%) of the respondents were females. Feminization is expected as most nurses are females. Feminization was also observed in some other related works among health workers: Ibadan study (97.5%), [5] Abeokuta-Ogun study (94.3%) [6], this finding is in contrast with a work in northern Nigeria where the majority (63.9%) of the health workers were males [7].

The result shows that the student respondents viewed constraints to effective clinical teaching assessment of nursing competencies from diverse perspectives which were also similar to the educators' views. Both groups understand the subject meaning and context of the study and their subject definitions as shown in theme 1 & 2 conform to the Cambridge Dictionary definition of the word "constraints" meaning "something that controls what you can do by keeping you within particular limits". The interpretation of the description of the meaning of constraints to effective clinical teaching and assessment of competencies depicts that both study groups knowledgeable on the background of the study.

Their responses when clustered revealed predominantly their common opinion of viewing constraints to effective clinical teaching and assessment of competencies to be challenges. barriers, flaws, restrictions, and difficulties encountered in the clinical area that influences teaching and assessment in the clinical setting. It is worth noting that, despite the need for effective clinical education, the criteria for determining effective clinical teaching and assessment of students' competencies remain poorly defined [8], there is need to gain better understanding of what constitute constraints to effective clinical teaching and assessment of nursing students' competencies as well as to explore the perceived solutions to the identified constraints.

In this present study, the nursing students and educators answered based on their reflection with the real situations where they have practiced within the clinical setting. As regards their views on what constitute constraints to effective clinical teaching and assessment of nursing students' competencies the findings revealed the most profound constraints as identified by both group

to be; lack of knowledge of the clinical placement objectives by the students, clinical staff, educators and assessors, subjectivity of the assessment tools, lack of cordial relationship among staff, lack of instrument to practice real hands on procedures, shortage of educators, preceptors and clinical staff, use of ancillary staff procedures, carrying out lack accommodation and far distance to clinical area. Non-challant attitude of the students to clinical posting, lateness to work, absenteeism, low participation in ward rounds and procedures, lack of disciplinary measures to airing students, and lack of committed clinical instructors. This finding is in line with the Tanzanian work on "factors influencing clinical teaching of midwifery student" using three schools of midwifery [9]. Their study revealed that clinical instructors and preceptors were overworked due to shortage of staff, the schools' skill laboratory and the hospital wards lacked basic equipment and necessary supplies. there were no clinical accomplishment guideline. teachers in the classroom and supervisors in the clinical areas do not cooperate with each other in training the students.

Learning objective is an element of teaching and learning process yet in this qualitative study both the students and educators identified lack of and knowledge of clinical learning objectives as a major constraint. The implication of this is that both students and assessors do not have a clear and specific goal in mind to achieve, no expected skill to acquire and by extension no direction of purpose. The result in consonance with the findings of the Thailand study on factors influencing clinical learning behavior of nursing students and the Mohammadi et al study on problems of clinical education from the teachers and senior nursing students perspective which revealed; inadequate number of teachers a significant influencing factor to the clinical learning behaviour of student nurses, lack of cooperation and improper communication of placement objectives with students in clinical education as the most important problems in clinical education [10,11].

The clinical teaching is the heart of the nursing's professional program and it remains the single most important resource in the development of competent, capable, caring nurses [12], yet in this study the respondents identified; lack of proper supervision and evaluation as constraints, lack of instruments for real hands on experience, and shortage of clinical staff as major constraints. When the numbers of nurse teachers

are inadequate, the few available ones are faced with the difficulties of coping with a large class of students for the classroom work and clinical supervision [13,14]. The implication is that there may be lack of mentoring and role modeling of the students which may develop in the students, fear, lack of confidence to carry out procedures and inferiority complex among their peers in the clinical area still driving further the gap in theory and practice.

Therefore, the quality and standard of clinical teaching and assessment as well as the availability of facilities, equipment, materials, and readiness of the students greatly impacts clinical teaching and assessment. In line with the above, a study stated that the clinical area is the venue where students must relate theory to practice, learn the necessary technical and interpersonal skills, make clinical judgments, become socialized into the profession, and begin to appreciate its values and ethics [15]. Hence, the need to make the clinical environment friendly and comfortable for students to learn.

5. CONCLUSION

Effective clinical teaching and assessment of clinical competencies of the nursing students is a principal process in producing competent graduate nurses. Considering the influence of nursing education on public health, identifying the constraints to effective clinical teaching and assessment of nursing students' competencies will help in restructuring and creating an clinical teaching authentic environment necessary for real 'hands-on clinical practice. The identified constraints as perceived by both groups in this study require supports and improvement upon by the institutions, nursing students and nurse educators for sustainable benefits to the consumers of health care.

CONSENT

On the chosen day for FGDs, before commencement of the sessions, consent was obtained, demographic details of the participants filled, then, introduction, purpose of the FGD and ground rules were read out.

ETHICAL APPROVAL

Ethical approval for this study was received from the Health, Research and Ethic Committee of National Orthopaedic Hospital, Igbobi, Lagos [Ref NOH/90/C/IX]. Administrative permission was obtained from each school studied. The participants were assured of their confidentiality and anonymity throughout the study.

ACKNOWLEDGEMENTS

We thank Adeleye, and Adefalu for assisting in collecting the field data and transcribing data derived from the focus group discussion. We are very grateful to Daniel Molobe for editing the work and we appreciate the Health, Research and Ethic Board Committee and management of National Orthopaedic Hospital Igbobi Lagos, Nigeria for their approval for this study and all the nursing schools used in this study for giving the administrative permission for the study to be conducted in their schools.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- 1. Henderson A, Tyler S. Facilitating learning in clinical practice: Evaluation of a trial of a supervisor of clinical education role. Nurse Education Practice. 2011;11:288–292.
- Shahsavari H, Yekta Z, Zare Z, Sigaroodi A. Iranian Effective Clinical Nurse Instructor evaluation tool: Development and psychometric testing. Iran Journal of Nursing and Midwifery. 2014;19(2):132– 138
- 3. Jones, Bartlett. Goals of Clinical Nursing Education. Learning. LLC; 2014.
- 4. Spurr S, Bally J, Ferguson L. A framework for clinical teaching: A passion-centered philosophy. Nurse Education Practice. 2010;10:349–354.
- Amosun, Degun, Atulomah, Olanrewaju, Aderibigbe. The level of knowledge regarding occupational hazards among nurses in Abeokuta, Ogun State, Nigeria. Current Research Journal of Biological Sciences. Maxwell Scientific. 2011;3(6): 586-590.
- 6. Fagbunmi A, Oworu J, Odunaiya N. Prevalence of musculoskeletal disorder among nurses in University College Ibadan. West Africa Journal of Nursing. 2008;19(1):21-25.
- Chidran O, Akosu J, Ezembi C, Bassi A, Zoalcah A. Perception of working condition among health workers in a State owned

- facility in Northeastern Nigeria. Annal of African Medicine. 2009;8(4):243-249.
- 8. Lee W, Cholowski K, Williams A. Nursing students' and clinical educators' perceptions of characteristics of effective clinical educators in an Australian university school of nursing. Journal of Advance Nursing. 2002;39(5):412-420.
- Sumari A, Eliaremisa N. Factors influencing clinical teaching of midwifery students in a selected clinical setting in Tanzania, Semantic Scholar; 2006. [Internet].
 Available:https://www.semanticscholar.org/ paper/Factors-influencing-clinical-teachingof-midwifery-Ayo-Ndetaulo/aa3f7462f9ed25ec6ce45e46594
- Wuthiphong J, Somsri D, Suthineum U. Factors influencing clinical learning behaviour of Nursing Students in Boromerajonani College of nursing. Chon Buri. Thailand: Nursing Education. 2009; 20:17.

e76bfba2a0d17

 Mohammadi N, Khodaveisi M, Jafarian N, Safari A. The problems of clinical

- education from the teacher and senior nursing students' perspective. Scientific Journal of Hamadan Nursing and Midwifery Faculty. 2004;1(23):43.
- Girija K, Raghda K, Jahara H, Suresh K. Undergraduate nursing students' perception of effective clinical instructor. International Journal of Nursing Science, Oman. 2013;3(2):38-44.
 DOI: 10.5923/j.nursing.20130302.02
- Lohor D. Assessing students' poor performances in General Nursing Certificate Examination. Presentation paper at the National conference of the Principals of schools of Nursing in Nigeria. Lagos; 2005.
- Mohammad R, Reza N. Nursing students' perspectives on clinical education. Journal of Advances in Medical Education and Professionalism. 2015;3(1):39-43.
- Rafiee G, Moattari M, Nikbakht A, Kojuri J, Mousavinasab M. Problems and challenges of nursing students' clinical evaluation: A qualitative study. Iran J Nurs Midwifery Res. 2014;19(1):41-49.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/59065

^{© 2020} Oseni et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.