Continuous recording to identify that there are at least 684 interventions for disorders of consciousness

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Abstract

The care of patients with disorders of consciousness (DoC) is variable worldwide. The aim of this study was to create a comprehensive, mutually exclusive and collectively exhausted, list of medical and nursing care interventions provided to patients with DoCs including those not documented in the EMR to better understand the care given to coma patients. After obtaining consent from patients' legally authorized representative, 12 hours of continuous video footage was collected inside the patient's intensive care unit room. Five patients aged 25-69 with a Glascow Coma Scale (GCS) of six or less were enrolled for a total of 57 hours. There were 684 unique interventions (575 physical and 109 cognitive) observed during collective observation periods. The bedside nurse was involved in 500 (73.1%) unique interventions, and family members, providers, and other personnel provided the remaining 26.9% of interventions. There is need to standardize the treatment of patients with disorders of consciousness across patients and hospitals around the world.

KEYWORDS: Nursing Research; Nursing; Disorders of consciousness; coma

BACKGROUND

An estimated 20 million people worldwide will experience coma or a disorder of consciousness (DoC) event every year (Helbok et al., 2022; Kondziella et al., 2022). When a neurological event occurs, a patient experiences primary brain injury and is at risk for secondary brain injury (Ortega-Pérez & Amaya-Rey, 2018). Care of the patient in coma (COPIC) includes patients with any DoC from any cause. It is recognized that nurses provide a high proportion of COPIC, but there is no comprehensive list of COPIC interventions (Murtaugh et al., 2024). In 2019, the Curing Coma® Campaign (CCC) was launched to promote recovery of consciousness for patients with coma and other DoC (Olson & Hemphill, 2021). In response, the past half-decade has seen a steady increase in DoC research. Nursing care interventions performed at an optimal time are linked by nursing theory to promote recovery; and poorly timed interventions will increase

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the risk of secondary brain injury and may delay recovery (Olson & Graffagnino, 2005a; Olson & Ortega-Pérez, 2019). Lack of a comprehensive list of COPIC-related nursing interventions creates a gap in research because these interventions become unknown confounders. The confounding effect reduces the reliability and validity of results from other DoC research and ultimately increases the required sample size for future studies.

There are a wide variety of interventions which are performed when providing care for patients with DoC (Banzon et al., 2023; Tinti et al., 2024). Studies that report an intervention was compared to usual care fail to account for heterogeneity of nursing care (Olson, 2019). To improve standardized collecting and recording of interventions, common data elements (CDE) have been developed for some interventions (Edlow et al., 2024). Although a few CDEs have been identified (Barra, Zink, Bleck, Caceres, et al., 2023), the type and variety of nursing interventions are not always documented in the medical record.

The use of audio video (AV) recording to capture events in the critical care setting is a fundamentally important step to reduce recall and measurement biases that have plagued critical care studies for decades. AV also has the advantage of reducing observer bias because the equipment can be placed in the room and is less conspicuous than is a human observer (Mahtani et al., 2018). There is also the advantage that recorded content can be manual scored to capture a greater number of interventions. The purpose of this study is to use AV recording to capture and catalogue COPIC interventions provided to patients with DoC.

METHODS

This single-center prospective observational study was approved by the local institutional review board prior to the initiation of any study activity. Patients were eligible for inclusion if they were admitted to the neuroscience intensive care unit (NSICU) within the past 7 days to enhance the potential to identify the highest number of acute interventions. Additionally, patients that had a current total Glasgow Coma Scale (GCS) score ≤ 6 (with a GCS motor score ≤ 4) were eligible for inclusion. The legally authorized representative of eligible patients was approached for consent and informed that up to 12 hours of care would be recorded using portable AV equipment (GoPro Hero 11).

To capture and identify a broad depth of interventions, the GoPro was placed in the corner of the patient's room with a continuous power source. The camera had a wide-angle lens and was positioned to capture all direct patient care activities carried out in the room during the 12-hour observation period; which may include observations made across 2 different nursing shifts. When the care team needed to perform sensitive tasks (hygiene, foley placement, EVD placement, etc.) the camera lens was covered, and these data were excluded. The lens was uncovered immediately after completion of sensitive tasks. Using pragmatic consecutive sampling we enrolled five patients between July and December of 2024. Each patient provided 12 hours of AV recording (60 hours). After the observation was complete the AV recording was uploaded to video editing software (Camtasia 2020) and all events recorded on video were catalogued and coded by members of the research team (BA, BD, EN, and AK).

Each event was noted in detail by the coders and entered into an electronic spreadsheet.

All interactions recorded by AV were cataloged and coded for each patient separately. The person performing the intervention was identified as either hospital staff or as a visitor. Staff were then identified as the primary registered nurse (RN), supporting RN, patient care technician, physician (MD), advanced practice provider (APP), respiratory therapist, vEEG technician, multidisciplinary team, or environmental service provider (EVS).

The coding involved review of all 12 hours of footage by select members of the research team, and notation of each and every procedure performed in patient care. All interventions were coded according to the personnel involved in the intervention; the patient's body system(s) targeted; the aspect of the nursing process targeted including assessment, diagnosis, planning, and implementation, evaluation (Hants et al., 2023); and the intervention category (e.g. invasive vs. non-invasive monitoring; management of bodily functions; medication administration; procedures bedside vs. procedures performed outside the patient room; charting; communication; environmental management; and patient travel to or from the room.) Within each category, a unique intervention could simultaneously involve multiple personnel; multiple body systems; multiple aspects of the nursing process; and multiple categories of intervention.

Every effort was made to reduce duplications of interventions taking into account purpose of the intervention. For example, propping a patient's upper extremities on a pillow was a separate intervention from propping a patient's lower extremities on a pillow, but propping a patient's left arm on a pillow was not a separate intervention from propping a patient's right arm on a pillow; moving the patient's bed position within the room for the purpose of exiting the room for travel was a different intervention than repositioning the patient's bed within the room for optimal environmental management.

RESULTS

The legally authorized representative for the subject provided written consent and all nurses, physicians, therapists, and other members of the healthcare team provided verbal consent to researchers before entering the room. Of the 5 subjects consented for videorecording 1 subject had an increase in their GCS score and provided only 9 hours of data. Patient age ranged from 25-69 years and included 3 females and 2 males of whom 4 identified as White and 1 identified as Black; all 5 identified as non-Hispanic. The mean GCS at time of enrolment was 3.5 (1.6) with 3 patients having a GCS of 3 and 2 patients having a GCS of 6. There were 684 unique interventions (575 physical and 109 cognitive) observed during the 57 hours of COPIC care for 5 patients admitted to the NSICU over a 5-month period. The bedside nurse was involved in 500 (73.1%) interventions, physicians in 92 (13.5%), and family in 73 (10.7%). Bedside nurses were the only personnel involved in 337 (49.3%) of tasks and physician were the only personnel involved in 27 (3.9%) of tasks. A second nurse was involved in 41 interventions (6.0%), Patient care technicians in 84 (12.3%), respiratory therapist in 44 (6.4%), and an electroen-

cephalography technician in 21 (3.1%) interventions.

Different body systems were targets in 637 (93.1%). The most common was cardiovascular (167, 24.4%), skin (137, 20.0%), and neurological (109, 15.9%) of interventions. Less commonly, interventions were targeted to immune (79, 11.5%), respiratory (65, 9.5%), gastrointestinal (43, 6.3%), musculoskeletal (24, 3.5%), and genitourinary (17, 2.5%). Fully 600 (87.7%) of the interventions were mapped to one or more aspect of the nursing process (Table 1). These included 190 (27.8%) assessment, 6 (0.9%) diagnosis, 176 (25.7%) plan-, 287 (42.0%) implement-, 62 (9.1%) evaluate- interventions. Of these, 307 (51.2%) were interventions only performed by nurses.

Table 1. Number of interventions or tasks identified and linked to at least one of the 5 core areas of the nursing process.

		Nursing Process				
		Assess	Diagnose	Plan	Implement	Evaluate
Body System involved	Neurological	50	1	16	36	14
	Cardiovascular	82	4	35	63	24
	Respiratory	28	0	9	29	6
	Gastrointestinal	8	0	2	29	4
	Genitourinary	6	1	1	10	0
	Musculoskeletal	6	0	2	14	1
	Immunological	17	0	38	33	3
	Integumentary	30	0	10	86	3
Intervention Category	Noninvasive procedure or monitoring	93	3	32	33	16
	Invasive procedure or monitoring	59	2	60	43	23
	Bodily Functions management	56	2	32	146	21
	Medication related	39	1	44	78	17
	Bedside procedure	40	1	85	76	27
	Task performed outside the room	1	1	16	16	0
	Documentation	14	0	15	12	7
	Communication	19	5	71	31	19
	Environment management	25	0	55	36	6
	Patient travel or transport related	10	1	13	24	2

Other intervention categories included 144 (21.1%) that were communication related, 141 (20.6%) that were medication related, and 324 (47.4%) interventions that were related to patient monitoring.

DISCUSSION

The catalogue of nearly 700 mutually exclusive and collectively exhaustive list of interventions far exceeds the number of interventions identified in the most recent National Institutes of health CDE paper for the DoC patient (Barra et al., 2023). Because the video recordings of the care delivered to the DoC patients included only those interventions performed inside the room and visually observable to the researchers coding the videos, there may be as yet unidentified other interventions. While some interventions occurring outside the patient's room (e.g. gathering supplies) may be less likely to impact patient outcomes; it is unclear if other actions (e.g., consulting with other nurses) happen that which may impact patient outcome. Similarly, mental tasks by staff were not catalogued and nursing theory on knowing identifies cognitive tasks as fundamentally linked to nurse sensitive outcomes (Swift & Twycross, 2020; Yousef et al., 2024).

The bedside nurse was the most frequently observed healthcare member providing care to the DoC patient; and the neurological, cardiovascular, and integumentary systems were the most prevalently targeted body systems of patient intervention. This is logical given that these patients were observed in an NSICU where determining the timing of interventions rely heavily on assessment skills (Olson & Graffagnino, 2005; Olson & Ortega-Pérez, 2019). In the NSICU, frequent neurological continuous cardiac and blood pressure monitoring are a hallmark of NSICU (Vyas et al., 2025). Frequent personal care is also explained by knowing that a patient with DoC is unable to move their body to protect pressure points and otherwise protectively position themselves in the bed. Monitoring of the patient—both through invasive means and non-nvasive means is a frequent task in neuroscience nursing and this accounted for an understandably high number of interventions (Barra et al., 2023; Norte et al., 2025). Managing the environment of the patient's room and communicating with the health care team, patient, and family also understandably was involved in a high percentage of interventions. The highest number of interventions coded (217) were related to each managing the patient's bodily functions and bedside procedures. Interestingly, bedside procedures tied for the highest category of individually coded interventions. Ideas for further research involve whether all neuroscience ICUs perform similar procedures in similar frequencies at the bedside for their DoC patients. Another purposeful area for research is exploring whether education and level of experience influence the frequency and type of procedures performed. For example, a novice nurse may react differently than a more experienced nurse (Benner, 1982).

Of note, documentation (charting) was only directly observed in a small percentage of interventions. This is probably due to the fact that care delivered outside the patient room was not captured. While options for charting in the patient room are promoted, there is emerging evidence that nurses are trending towards charting at centralized stations instead of in the room (Gauthier-Wetzel, 2024). It is not surprising that diagnosis is an un-

derrepresented aspect of the nursing process and linked to a relatively smaller number of observed and coded interventions. While nurses have a wide scope of practice, it is not within the nurse's scope of practice to medically diagnose a patient based on interpretation of diagnostic test results (Considine et al., 2023). The few times diagnosis was identified within the provided intervention, handoff was being given between practitioners where critical diagnoses were shared (2 instances); and changes to the treatment plan were enacted due to the recognition of hypotension (1 instance), high intracranial pressure (1 instance), and EKG changes (2 instances).

The majority of interventions observed and performed by the interdisciplinary health care team were not linked to a direct physician order to do so. COPIC care is inherently multidisciplinary (Kim et al., 2024; Mainali et al., 2022). For example, while cardiac monitoring may be a standing order for patients admitted to the NS ICU, placing and replacing electrode stickers, monitoring quality of waveforms, and readjusting lead wires off the patient's chest for skin protection are all interventions performed by the bedside nurse for the DoC patient. In this way, these "unordered" interventions are not standardized, documented, or catalogued as routine care. These interventions become the confounders and modifying variables that affect clinical trial results. An area ripe for further research would be to compare each DoC order set to coded interventions according to whether they were directly ordered or whether the intervention could be determined to result from nursing judgment.

LIMITATIONS

One limitation is that only hands-on interventions performed inside the patient's room were captured on video. It has been argued that planning and interventions which are not hands-on activities performed directly to the patient still have immense effect on patient outcomes (Nibbelink & Brewer, 2018; Olson et al., 2001; Olson & Ortega-Pérez, 2019). For this reason, further research should be conducted which considers the larger scope of the hospital environment and its systems operating behind the scenes. As required by IRB regulations, all staff caring for the patient were aware recording was in progress. We acknowledge that this approach may have introduce an observer bias. However, our focus remained on documenting the actual interventions performed regardless of any inherent biases. In capturing both biased and unbiased care, we created a comprehensive record that reflects real-world practices.

CONCLUSION

The 684 discrete interactions between patients with DoC and hospital staff or visitors is the most comprehensive list of interventions performed during COPIC. The list provides a platform for exploring the role that individual, or combined, interventions may play in promoting recovery of consciousness. The expanse of this list also underscores the need to standardize care when performing clinical trials that enroll patients with DoC. COPIC care is heterogenous by default and there are no data supporting the assumption that usual care is similar at any two different hospitals.

REFERENCES

Banzon, P. C., Vashisht, A., Euckert, M., Nairon, E., Aiyagari, V., Stutzman, S. E., & Olson, D. M. (2023). Original Research: Practice Variations in Documenting Neurologic Examinations in Non-Neuroscience ICUs. *Am J Nurs*, *123*(1), 24–30. https://doi.org/10.1097/01.NAJ.0000905564.83124.2d

Barra, M. E., Zink, E. K., Bleck, T. P., Cáceres, E., Farrokh, S., Foreman, B., Cediel, E. G., Hemphill, J. C., Nagayama, M., Olson, D. M., & Suarez, J. I. (2023). Common Data Elements for Disorders of Consciousness: Recommendations from the Working Group on Hospital Course, Confounders, and Medications. *Neurocrit Care*, *39*(3), 586–592. https://doi.org/10.1007/s12028-023-01803-4

Barra, M. E., Zink, E. K., Bleck, T. P., Caceres, E., Farrokh, S., Foreman, B., Cediel, E. G., Hemphill, J. C., Nagayama, M., Olson, D. M., Suarez, J. I., & Curing Coma Campaign, i. c. m. (2023). Common Data Elements for Disorders of Consciousness: Recommendations from the Working Group on Hospital Course, Confounders, and Medications. *Neurocrit Care*, *39*(3), 586–592. https://doi.org/10.1007/s12028-023-01803-4

Benner, P. (1982). From novice to expert. *Am J Nurs*, *82*(3), 402–407.

Considine, J., Hutchinson, A. M., Mitchell, I., Bohingamu Mudiyanselage, S., Mohebbi, M., Watts, J. J., & Bucknall, T. (2023). Vital sign assessment and nursing interventions in medical and surgical patients with rapid response system triggers. *J Clin Nurs*, *32*(19-20), 7310–7320. https://doi.org/10.1111/jocn.16810

Edlow, B. L., Claassen, J., & Suarez, J. I. (2024). Common data elements for disorders of consciousness. *Neurocrit Care*, *40*(2), 715–717. https://doi.org/10.1007/s12028-023-01931-x

Gauthier-Wetzel, H. E. (2024). Bedside Nurse Documentation Practices: At the Patient Bedside or Not? *Comput Inform Nurs*, *42*(9), 629–635. https://doi.org/10.1097/cin.0000000000001165

Hants, L., Bail, K., & Paterson, C. (2023). Clinical decision-making and the nursing process in digital health systems: An integrated systematic review. *J Clin Nurs*, *32*(19-20), 7010–7035. https://doi.org/10.1111/jocn.16823

Helbok, R., Rass, V., Beghi, E., Bodien, Y. G., Citerio, G., Giacino, J. T., Kondziella, D., Mayer, S. A., Menon, D., Sharshar, T., Stevens, R. D., Ulmer, H., Venkatasubba Rao, C. P., Vespa, P., McNett, M., Frontera, J., Curing Coma, C., & its Contributing, M. (2022). The Curing Coma Campaign International Survey on Coma Epidemiology, Evaluation, and Therapy (COME TOGETHER). *Neurocrit Care*, *37*(1), 47–59. https://doi.org/10.1007/s12028-021-01425-8

Kim, K. S., Polizzotto, L., Suarez, J. I., Olson, D. M., Hemphill, J. C., 3rd, & Mainali, S. (2024). An Update on Curing Coma Campaign. *Semin Neurol*, *44*(3), 389–397. https://doi.org/10.1055/s-0044-1785478

Kondziella, D., Amiri, M., Othman, M. H., Beghi, E., Bodien, Y. G., Citerio, G., Giacino, J. T., Mayer, S. A., Lawson, T. N., Menon, D. K., Rass, V., Sharshar, T., Stevens, R. D., Tinti, L., Vespa, P., McNett, M., Venkatasubba Rao, C. P., Helbok, R., & Curing Coma Campaign, C. (2022). Incidence and prevalence of coma in the UK and the USA. *Brain Commun*, *4*(5), fcac188. https://doi.org/10.1093/braincomms/fcac188

Mahtani, K., Spencer, E. A., Brassey, J., & Heneghan, C. (2018). Catalogue of bias: observer bias. *BMJ Evid Based Med*, *23*(1), 23–24. https://doi.org/10.1136/ebmed-2017-110884

Mainali, S., Aiyagari, V., Alexander, S., Bodien, Y., Boerwinkle, V., Boly, M., Brown, E., Brown, J., Claassen, J., Edlow, B. L., Fink,

E. L., Fins, J. J., Foreman, B., Frontera, J., Geocadin, R. G., Giacino, J., Gilmore, E. J., Gosseries, O., Hammond, F.,…J, I. S. (2022). Proceedings of the Second Curing Coma Campaign NIH Symposium: Challenging the Future of Research for Coma and Disorders of Consciousness. *Neurocrit Care*, *37*(1), 326–350. https://doi.org/10.1007/s12028-022-01505-3

Murtaugh, B., Olson, D. M., Badjatia, N., Lewis, A., Aiyagari, V., Sharma, K., Creutzfeldt, C. J., Falcone, G. J., Shapiro-Rosenbaum, A., Zink, E. K., Suarez, J. I., & Silva, G. S. (2024). Caring for Coma after Severe Brain Injury: Clinical Practices and Challenges to Improve Outcomes: An Initiative by the Curing Coma Campaign. *Neurocrit Care*. https://doi.org/10.1007/s12028-024-02116-w

Nibbelink, C. W., & Brewer, B. B. (2018). Decision-making in nursing practice: An integrative literature review. *J Clin Nurs*, *27*(5-6), 917–928. https://doi.org/10.1111/jocn.14151

Norte, R. J., Adegbola, M., Alejandro-White, J., Bashir, M., Bashmakov, A., Berney, A., Denbow, M., Doyle, B., Gunna, S., Jones, E., Joseph, S., Jung, W., Kamal, A., Kleckner, C., Lee, J., Mattison, D., Nairon, E. B., Namirembe, A., Olson, D. M.,…Wilson, J. (2025). The 2025 International Neuroscience Nursing Research Symposium Abstracts. *J Neurosci Nurs*. https://doi.org/10.1097/jnn.0000000000000816

Olson, D. M. (2019). What Is Usual Care? *J Neurosci Nurs*, *51*(2), 61. https://doi.org/10.1097/jnn.0000000000000432

Olson, D. M., Borel, C. O., Laskowitz, D. T., Moore, D. T., & McConnell, E. S. (2001). Quiet time: a nursing intervention to promote sleep in neurocritical care units. *Am J Crit Care*, *10*(2), 74–78.

Olson, D. M., & Graffagnino, C. (2005a). Consciousness, coma, and caring for the brain-injured patient. *AACN Clinical Issues*, *16*(4), 441–455.

Olson, D. M., & Graffagnino, C. (2005b). Consciousness, coma, and caring for the brain-injured patient. *AACN Clin Issues*, *16*(4), 441–455. https://doi.org/10.1097/00044067-200510000-00003

Olson, D. M., & Hemphill, J. C., 3rd. (2021). The Curing Coma Campaign: Challenging the Paradigm for Disorders of Consciousness. *Neurocrit Care*, *35*(Suppl 1), 1–3. https://doi.org/10.1007/s12028-021-01290-5

Olson, D. M., & Ortega-Pérez, S. (2019). The Cue-Response Theory and Nursing Care of the Patient With Acquired Brain Injury. *J Neurosci Nurs*, *51*(1), 43–47. https://doi.org/10.1097/jnn.0000000000000426

Ortega-Pérez, S., & Amaya-Rey, M. C. (2018). Secondary Brain Injury: A Concept Analysis. *J Neurosci Nurs*, *50*(4), 220–224. https://doi.org/10.1097/jnn.0000000000000384

Swift, A., & Twycross, A. (2020). Using ways of knowing in nursing to develop educational strategies that support knowledge mobilization. *Paediatr Neonatal Pain*, *2*(4), 139–147. https://doi.org/10.1002/pne2.12037

Tinti, L., Lawson, T., Molteni, E., Kondziella, D., Rass, V., Sharshar, T., Bodien, Y. G., Giacino, J. T., Mayer, S. A., Amiri, M., Muehlschlegel, S., Venkatasubba Rao, C. P., Vespa, P. M., Menon, D. K., Citerio, G., Helbok, R., & McNett, M. (2024). Research considerations for prospective studies of patients with coma and disorders of consciousness. *Brain Commun*, *6*(1), fcae022. https://doi.org/10.1093/braincomms/fcae022

Vyas, M. B., Bautista, C., Daniels, L., Guanci, M. M., & Rhudy, L. (2025). The Essential Components of Adult Critical Care Neuroscience Nursing Orientation: A Delphi Study. *J Neurosci Nurs*, *57*(1), 3–8. https://doi.org/10.1097/jnn.0000000000000807

Yousef, K. M., Alananzeh, I., Beegom, S., Chavez, J., Hatahet, S., Khalil, H., Krom, Z., & Svetlov, O. (2024). Assessing Outcome Measurements and Impact of Simulation in Neurocritical Care Training: A Systematic Review. *J Neurosci Nurs*, *56*(4), 130–135. https://doi.org/10.1097/jnn.0000000000000767

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