CANADIAN HEALTH INFORMATION MANAGEMENT ASSOCIATION

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An Introduction to Computer-Assisted Coding

A professional practice brief consists of two major categories, both designed as professional development (PD) tools to advance health information professional practice and standards to support the delivery of quality health care. A PPB may relate to either category, or both. The two major categories are as follows:

☑ Guidelines for Practice **☑ Professional Resource**

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An Introduction to Computer-Assisted Coding

Preface

This professional practice brief (PPB) is intended to act as an introduction for health information management (HIM) students and professionals who may not be familiar with computer-assisted coding (CAC), or for HIM professionals looking to refresh their fundamental knowledge of CAC. The goal of this PPB is to outline the benefits, risks, and implementation process of CAC. The inside workings of CAC software will not be discussed as this is beyond the scope of this PPB.

Introduction

All health facilities in Canada collect demographic and clinical information from patients. A clinical coder abstracts relevant information from patient records to assign clinical codes that reflect the diagnoses and procedures described to accurately describe the episode of care (Nguyen et al., 2018). On a more aggregate level, these clinical codes are used for a variety of purposes, both internal and external to the facility. Internal uses include budgeting, resource planning, and provincial and territorial government funding, while external uses include health care reporting by organizations such as the Canadian Institute for Health Information (CIHI) and Health Canada, to name a few. With the advancement of medical technology and the push towards electronic medical record (EMR) implementation, there has been an increase in the number of organizations investigating computer-assisted coding solutions (Campbell & Giadresco, 2019). As facilities experience a greater demand for accurate, timely data, clinical coders are struggling to meet their needs (Campbell & Giadresco, 2019). Developers designed CAC as a tool to aid clinical coders in their monumental task of meeting increased demands (AHIMA, 2013; “Computer Assisted Coding,” 2017). It is important to note that CAC is not designed to replace clinical coders; rather, it is intended to be a long-term, cost-effective solution that can simplify specific portions of the coding process so that clinical coders can more effectively use their expertise to focus on more complex cases and ensure correct code selection (AHIMA, 2013; “Computer Assisted Coding,” 2017).

CAC is software that acts as an aid to the process of clinical coding in a health care setting (AHIMA, 2013). There are two parts to CAC software: natural language programming (NLP) and structured input (SI) (Benson, 2012). NLP allows the software to process the structured data (M. Sharafi, personal communication, July 12, 2020). NLP software works by utilizing an algorithm to scan electronic documentation and select specified terms that have been pre-programmed to direct coders to certain clinical codes. Inpatient facilities mainly use NLP software. It is most effective in facilities that have a high percentage of their documentation generated and stored electronically. Outpatient facilities mainly use SI software, which works differently than NLP in that it provides users with an interface from which they can select items from a pre-determined menu. Each item is linked with clinical codes. Appropriate codes are suggested while the documentation is created (Benson, 2012). It is difficult to have a full understanding of CAC without understanding these two processes (Campbell & Giadresco, 2019).

Background

CAC software has been in development since the 1980s; however, The Ottawa Hospital was the first facility to pilot CAC implementation in Canada in 2014 (3M, 2019), where it was used mainly in an outpatient coding capacity. Since that time, CAC implementation has increased and the first inpatient group went live at the Scarborough Health Network in 2017 (M. Sharafi, personal communication, July 12, 2020). This trend is expected to continue over the next decade as hospitals realize that there is "a proven return on investment with technology that can assist in the coding process and ensure a high level of accuracy" (3M, 2019). Reasons for this increase include the implementation of ICD-10, which significantly increased the number of clinical codes being used, and an increase in demand for accurate data ("Computer Assisted Coding," 2017). Additional factors include a decrease in the number of experienced clinical coders as retirement among individuals in the profession increases, and an increase in the number of encounters nationwide as the population ages (a factor that has also seen an increase in patients with comorbidities being treated) ("Computer Assisted Coding," 2017). These factors mean facilities must find ways to make the process of clinical coding more efficient and accurate. CAC offers a long-term, cost-effective, and practical solution ("Computer Assisted Coding," 2017).

What is CAC?

Computer-assisted coding, or CAC, is software designed to aid facilities in ensuring that their need for accurate data collection and reporting is met in a cost-efficient and timely manner (AHIMA, 2013). By annotating important medical terms and phrases in the clinical documentation, the software suggests clinical codes that coders may then accept, modify, or reject (M. Sharafi, personal communication, July 12, 2020). CAC ensures that clinical coders can use their skills and talents to the fullest by automating parts of the coding process, thus freeing them from time-consuming tasks such as searching through clinical documentation or reviewing the entire patient chart to identify any pre/post comorbidities (M. Rasmussen, personal communication, July 9, 2020). CAC software allows coders to review and edit codes suggested by the software and spend more of their time focusing on complex patient charts and exceptional cases that cannot be coded by CAC (AHIMA, 2013).

CAC solutions can be standalone or integrated ("Computer Assisted Coding," 2017). CAC is most effective when interoperable with existing systems; thus, it is more common for facilities to utilize integrated over standalone solutions, the latter of which only perform the function of encoding ("Computer Assisted Coding," 2017; Tully & Carmichael, 2012). Integrated CAC systems can provide users with a number of applications, including but not limited to computer-assisted encoding, management reporting and analytics, clinical code auditing, and clinical documentation improvement (CDI) ("Computer Assisted Coding," 2017) [see also PPB 0046.18 Clinical Documentation Improvement]. Services offered for CAC include support, maintenance, education, and training services ("Computer Assisted Coding," 2017). Whether standalone or integrated, all CAC software falls into one of two categories: natural language programming (NLP) or structured input (SI) (Benson, 2012). These terms refer to the process by which CAC processes clinical information and suggests codes (Campbell & Giadresco, 2019).

Natural Language Programming (NLP)

NLP is a "computer process that analyzes text and extracts implied facts as coded data" (Bronnert, 2011). The software "interprets text from multiple documentation sources… and assists the coder to assess the clinical picture" (3M, 2019). It is best suited for inpatient facilities where there are large amounts of documentation being

stored electronically (Campbell & Giadresco, 2019). The more electronic documentation in use, the more effective NLP is. The reason for this is simple, NLP works by scanning through patient charts, essentially performing a search for certain pre-programmed target words. The program picks up on those words and uses an algorithm to suggest codes based on the combination of target words found within the documentation (Campbell & Giadresco, 2019). These coding suggestions are then presented to the clinical coders via the CAC interface, where they can then verify or change the code selections (AHIMA, 2013). With each selection the coder makes, the software becomes 'smarter' by remembering selection patterns and applying them to future code suggestions and so, "…the more [it] is used, the smarter it gets" (3M, 2019; Butler, 2019). The software searches all documents in a patient's chart and "annotates each document for possible diagnoses and procedures" (3M, 2019). Due to the way that NLP utilizes electronic clinical documentation, the software must be interoperable with the current electronic clinical documentation systems in place. If the NLP software is not able to effectively and efficiently access clinical documentation, it may act as a hindrance to clinical coders rather than an aid (Stanfill & Marc, 2019). Facilities that utilize a hybrid system can still benefit from NLP implementation; scanned or handwritten documents can often be processed into formats that are compatible with NLP using optical character recognition (OCR) software (AHIMA, 2013; Campbell & Giadresco, 2019).

CAC software can use NLP technology either as the prime solution alone or the prime solution combined with cloud solutions (A. Chowdhury, personal communication, July 9, 2020). When NLP is the prime solution it uses a rule-based NLP engine that "analyzes and interprets text from multiple documentation sources" (A. Chowdhury, personal communication, July 9, 2020). The rule-based NLP engine "can identify and annotate diagnoses and procedures" noted within (A. Chowdhury, personal communication, July 9, 2020). When CAC uses NLP technology as a "combination of prime and cloud solutions, the NLP engine can use both rule-based and statistical methods to provide both annotation and auto-suggested code. A cloud solution can learn from other CAC systems and improve the precision of the auto-suggested code, as its continually learning from user selection" (A. Chowdhury, personal communication, July 9, 2020).

Structured Input (SI)

SI is best suited for outpatient facilities where there is little variation in the clinical documentation process because SI simultaneously creates clinical documentation and provides clinical code suggestions (Campbell & Giadresco, 2019). SI performs this function by utilizing an interface with pre-determined menu options for the user to select (often in the form of a drop-down menu) (Benson, 2012; Campbell & Giadresco, 2019). As the user builds the clinical documentation by selecting the menu options that reflect the patient's encounter, the program suggests codes that have been pre-programmed to be attached to each selection (Campbell & Giadresco, 2019). The program then analyzes the combination of selections made and presents clinical coders with its code selections for them to verify by either confirming or editing the software's code selections (Benson, 2012; Campbell & Giadresco, 2019).

What CAC Means for Clinical Coders

A common consensus among clinical coders is that CAC implementation will lead to their positions becoming obsolete; however, this is one of the biggest misconceptions about CAC (Stanfill & Marc, 2019). CAC is not designed to replace clinical coders, nor does it have the capacity to. Instead, CAC presents coders with new roles and opportunities to collect, validate, and analyze patient data and clinical codes. Studies have shown that CAC software without experienced clinical coders guiding its implementation and use is less efficient and less accurate than clinical coders alone (Stanfill & Marc, 2019). The goal of CAC is to simplify and automate parts of the coding process, freeing coders from the non-coding tasks of organizing documents and searching for relevant information, which consumes much of their time (3M, 2019). In a CAC environment, coders can focus their much-needed attention towards their new roles and exceptional cases that are too complex for CAC to code, thus helping to improve both the productivity and accuracy of the coding process (AHIMA, 2013; Nguyen et al., 2018).

What CAC means for clinical coders is a shift of focus and a need for new skills, while continuing to utilize their knowledge of clinical coding and the clinical coding process (Campbell & Giadresco, 2019). An important factor to successful CAC implementation is adequate training and education for staff ahead of go-live, specifically the training and education of clinical coders (Tully & Carmichael, 2012). Before training it may be helpful for

clinical coders to "undergo a self-assessment of their current skills and strengths" to help identify any areas where training or education may be especially effective or useful (AHIMA, 2013). In addition to the knowledge required of a clinical coder in a traditional role, clinical coders in a CAC environment require a thorough understanding of CAC software and systems, NLP, SI, the EMR system use, document generation and storage within the EMR, as well as troubleshooting techniques (Campbell & Giadresco, 2019). Clinical coders working in a CAC environment will also benefit from experience working with an automated workflow (Bronnert, 2011).

Traditionally, clinical coders were responsible for scouring through patient charts, finding key identifying information, and selecting clinical codes (Campbell & Giadresco, 2019). In a CAC environment, clinical coders take on an editor and analyst role. A coding editor works to verify that codes selected by CAC software are accurate. Their knowledge of clinical coding, pathophysiology, anatomy, and reporting guidelines makes them crucial to CAC implementation and functioning. CAC software needs to be closely monitored for accuracy to ensure the best possible reporting practices and clinical coders possess the unique skills and expertise to do so (Campbell & Giadresco, 2019). Coding editors also ensure accurate coding by clarifying any vague terminology or documentation with care providers via physician queries. A coding analyst uses quality and quantity analyses to ensure the CAC system is producing quality data. The quality data that is produced then leads to an increase in weighted cases with the potential to impact funding and the information used for decision making and patient safety (J. Doan, personal communication, July 9, 2020). The analyses of data across different platforms is used to ensure consistency and data integrity is maintained, identify and report any incomplete documentation, and work with other stakeholders to ensure the definitions utilized by the CAC software are accurate and being used correctly (Campbell & Giadresco, 2019).

Benefits

There are numerous benefits to CAC implementation, whether NLP or SI. These benefits include coding efficiency, the opportunity for coders to expand their current roles, and interoperability with other HIM software (Covit, 2016). Benefits of CAC implementation include an increase in productivity (case studies have found that successful CAC implementation can lead to a 20% increase in productivity), greater coding accuracy, and improved

capturing of applicable codes. This, in turn, leads to "decreased overtime expenses and audit costs, narrowing of the skill and knowledge gap between experienced and new clinical coders, and improved transparency and compliance due to audit functions" (Campbell & Giadresco, 2019).

Efficiency

One of the main benefits of implementing a CAC system is coding efficiency. Coding is a time-consuming process where a coder must search through all relevant documentation within a patient chart to attach the proper codes for the encounter (Covit, 2016). As CAC runs through patient files in seconds, consistently attaching suggested codes, coding backlogs can be eliminated. Coders then just need to approve the codes to ensure each matches the encounter (Powell, 2019). This can translate into individual time savings for coders and enables them to complete the coding process within the deadlines which have been set. Coder variability is lessened as the program will select the same codes each time it identifies the same diagnosis or procedure (Covit, 2016).

Interoperability

Interoperability is an important factor with any software in the HIM field, and even more so in the use of CAC (Sharafi, 2019). An example of this is given by Scarborough Health Network: "A key feature of the tool is the 'coder view,' which brings in all documents used in the coding process into a single point of access through an HL7 interface. This allows the coder to read the patient's clinical story without having to go in and out of multiple sources and search for documents" (Sharafi, 2019) [see also PPB 0027R.18 Health Level 7].

Implementation

Many factors have been identified as leading to successful CAC implementation, including assessment, planning, training, and ongoing support (AHIMA, 2013). A facility planning to implement CAC must first create a dedicated project team that will be responsible for overseeing the planning and implementation of the CAC system. The team should be comprised of multiple internal and external stakeholders, each of whom will bring to the table a unique set of skills and knowledge relevant to the project. AHIMA suggests the team may include the following members:

- Coding professionals

- Data quality specialists
- Clinical documentation professionals
- Coding managers and HIM directors
- Physician liaisons
- IT professionals
- Informatics and data reporting teams
- Various clinical staff as determined by the project
- EMR vendor representatives
- Project management
- Quality and performance improvement teams

In advance of implementation, the team should assess the facility's current workflow and level of electronic documentation (AHIMA, 2013) [see also PPB 0044.18 Redesigning Clinical Workflow to Enable EHR Implementation]. If most clinical documentation is not electronic, the facility should consider tackling that project before implementing a CAC system, as "the more electronic the health record, the more an organization can leverage the NLP technology" (3M, 2019; AHIMA, 2013). CAC implementation comes with a high initial cost. The cost of implementation must be offset by an identified return on investment over a pre-determined time period. This occurs as the coding process is improved, costs are reduced, and the quality of health care is improved (3M, 2019). If the project team determines that the facility is utilizing an appropriate amount of electronic clinical documentation, they need to assess the current coding workflow. In doing so, the project team will be able to identify areas where CAC could be the most beneficial. Again, it is important to keep in mind that CAC software is not designed to automate the entire coding process, so it is of vital importance that time, and care be taken to accurately assess which specific steps within the coding workflow CAC would be most impactful and beneficial.

To measure the success of CAC implementation, the project team needs to establish measurable performance indicators and measurable benefits of the system (AHIMA, 2013). This allows the team and the facility to track the rate at which CAC is meeting the predetermined goals and whether any changes need to be

made during or after implementation to meet them (AHIMA, 2013). Areas to be considered include clinical coding productivity and accuracy, reliability, consistency, and transparency of process (Campbell & Giadresco, 2019). Once the project team has determined what areas within the coding process would most benefit from CAC, they need to ensure the software they consider is compatible with the current EMR in place, as well as determine what impact implementation will have on the tools the clinical coders are already using (e.g., encoding software) (AHIMA, 2013).

Training and ongoing support are two more crucial factors in successful CAC implementation (AHIMA, 2013). Prior to implementation, the project team should work to establish clear roles for internal stakeholders, including clinical coders, coding managers, health information technology (HIT) professionals, and the health information management (HIM) department. All internal stakeholders should receive training and education to ensure they can utilize CAC software to its fullest potential, thus ensuring that the facility reaps the maximum benefit possible from implementation. After implementation, internal stakeholders must continue to receive training as the CAC system evolves to reflect changes over time. Examples include changes to CIHI mandatory reporting standards or institutional coding guidelines.

HIM and HIT professionals must continue to measure and monitor the success and effectiveness of CAC following implementation (Campbell & Giadresco, 2019). The performance indicators created before implementation should be followed up on to determine the rate of success and identify any need for change (Campbell & Giadresco, 2019).

Scarborough Health Network's CAC Implementation Experience

Scarborough Health Network successfully implemented CAC software to help them cope with challenges faced by their clinical coding process (Sharafi, 2019). These challenges included a shortage of experienced coders, tight deadlines, increased need for accurate data, and ongoing changes to funding and reporting requirements by the Ministry of Health and Long-Term Care. The facility's project team identified that the process of reading through patient charts in the hybrid system at the facility was an area where CAC could improve productivity and efficiency. The team found a vendor that was able to supply them with software that met their needs. With the

use of HL7 in the software, the program can streamline workflow by bringing all the documents together. The NLP engine is then able to annotate diagnosis and procedure terms. The coder can click on any term and will be taken to the correct place in the document, allowing for the correct code to be found quickly. Differences between progress notes can also be highlighted, making it more efficient for the coder to verify potential codes (A. Chowdhury, personal communication, July 9, 2020). The project team set measurable performance indicators, namely accuracy in diagnosis code capturing and impact on weighted cases. To measure the success of the implementation, the facility conducted a study of coded charts prior to implementation and compared them to charts coded after implementation. The study found that accuracy in diagnoses capturing increased when coders used CAC, the number of diagnoses coded per chart increased, and a 3–13% increase in various weighted cases was noted (Sharafi, 2019).

Challenges

While CAC implementation offers numerous benefits to coding systems in terms of productivity and accuracy, there are challenges that may need to be overcome to ensure successful implementation (Campbell & Giadresco, 2019). Initial implementation costs, a facility needs assessment and implementation planning, a need for ongoing training and education, CAC software maintenance and surveillance, the need for system and software integration, the perceived complexity of the program, the need for consistent clinical documentation standards, and staff replacement concerns are just some of the challenges to successful CAC implementation (Campbell & Giadresco, 2019; Covit, 2016).

The largest hurdle from a change management perspective was staff adoption and understanding how this tool would enhance current coding workflow and practices. Benefit realization through use of various metrics such as an increase in productivity, potential impact on weighted cases and coding specificity was used to assist with employee buy-in. Staff who were initially reluctant to embrace CAC now fully see the benefit in their day-to-day coding workflow. (J. Doan, personal communication, July 9, 2020).

The slow rate of EMR adoption in Canadian hospitals is also a considerable challenge. As previously mentioned, CAC is most effective when most patient data are stored in electronic format, and further benefits

can be realized when this is the case. Also, current security and privacy laws are not sufficient for this technology, and this presents challenges as each province has their own privacy laws and a cloud environment currently housed in the United States (A. Chowdhury, personal communication, July 9, 2020). The combination of these risks and concerns have slowed the implementation of CAC software (Covit, 2016).

Cost

CAC systems are expensive and range in price depending on the requirements of each facility. Historically, there have been limited studies that have demonstrated the return on investment following CAC implementation, which led facilities to see CAC as low priority (Covit, 2016). Added to the initial cost of the system is preparation, implementation, and training costs (Covit, 2016). It can be challenging for facilities to allocate the resources necessary to facilitate the vital training required before implementation, as well as the ongoing training after implementation, due to the demand on resources such as staff time and finances (Campbell & Giadresco, 2019). Like any system, CAC is only as effective as those using it; to reap the maximum benefit from a CAC system, users must be fully prepared with the knowledge and skills required to use it to its full potential (Campbell & Giadresco, 2019). To minimize this challenge, facilities should ensure they can budget both the necessary time and money to meet their unique CAC training and education needs (AHIMA, 2013).

Required preparation and ongoing support

One of the main challenges with CAC implementation is that the needs of each facility are unique—so while there are best practices for implementation, there is no gold standard for measuring the success or effectiveness of CAC implementation (Campbell & Giadresco, 2019). As discussed earlier, the planning phase of CAC implementation is of the utmost importance to ensure success (AHIMA, 2013).

Additionally, CAC works best in a completely EMR-based system and, as such, it is recommended that any documentation needed for the coding process be converted to electronic text prior to implementing CAC software (Bronnert, 2011).

CAC systems are ever evolving. Canadian coding standards and individual facility guidelines are constantly being assessed and adjusted, so the system and its definitions need to be closely monitored and updated as

needed. This may introduce the need for dedicated professionals capable of ensuring system optimization. Ensuring that clinical coding staff are adequately trained will lessen the impact of this risk. Clinical coders, coding analysts, and coding managers, in tandem with HIT professionals, vendors, and other stakeholders, can work to ensure the CAC system continues to prove effective once implemented. Prior to implementation, the facility should determine a set of desired outcomes that are measurable. Tracking progress and looking at performance indicators will also help reduce the impact of this challenge (AHIMA, 2013).

Information quality

CAC software can encounter challenges in interpreting clinical documentation for a few reasons (Campbell & Giadresco, 2019). First, the quality of the inputted information presents a potential risk because CAC software is only as good as the information inputted (Powell, 2019). If a medical chart is incomplete in any way, it will not be coded correctly regardless of whether the CAC software utilizes NLP or SI. An additional concern specific to NLP is that it works by looking for pre-determined words and phrases, so any clinical documentation that contains misspelled terms, alternative words/phrases, or abbreviations or symbols not defined in the system will be miscoded (Campbell & Giadresco, 2019). Whatever the cause, miscoding results in inaccurate reporting. It becomes increasingly important that any chart deficiencies are identified, and physicians and other clinicians are thorough and accurate in their documentation (Powell, 2019). Also, the coder needs to adhere to CIHI coding standards. The NLP engine relies on 'learning' from coder input. If a coder accepts an incorrect code it will 'learn' incorrectly and suggest the code again, possibly leading to the incorrect coding of patient records. Vendors of CAC systems need to work with HIM departments to enhance system pathways and any algorithms to include in future system enhancements (J. Doan, personal communication, July 9, 2020).

Ethical issues

Upcoding. This is the fraudulent and illegal process whereby a more complex code or unbundled service (i.e., many separate codes chosen rather than the correct, all-encompassing code) is intentionally selected over the correct code, resulting in a higher resource intensity weight (RIW). This type of fraud may seem like an easy way to recoup the cost of CAC software. As has always been the case, coders using CAC must continue to adhere

to the CHIMA Code of Ethics and CIHI coding standards. Coders must scrutinize suggested codes and have the final decision to ensure the code accurately reflect diagnoses and procedures performed (Stanfill & Marc, 2019).

Privacy and liability. Potential privacy issues must be taken into consideration regarding CAC usage (Stanfill & Marc, 2019). Policies may need to be updated to ensure all relevant institutional guidelines and legislation are being adhered to. This technology is still relatively new, and questions still exist around liability issues. Examples of questions privacy policies may need to address include 'who is liable for care when using CAC or other AI software?' and 'does this fall on the physician, or partially on the developer of the software?' (Stanfill & Marc, 2019). [See also PPB 0049.20 Artificial Intelligence]

HIM professionals, HIT professionals, and clinicians all have important roles to play to ensure patient privacy. Coders must audit charts and query physicians on any unclear information. Physicians must understand CAC and the importance of consistent, complete, accurate clinical documentation. HIT and HIM professionals must work with vendors to ensure each algorithm can be inspected and explain its output (Stanfill & Marc, 2019).

Looking Ahead: The Future of CAC

As facilities across Canada continue the journey towards HL7, technology will continue to play an increasingly larger role in our health care system [see also PPB 0027R.18 Health Level 7]. Clinical coders should expect to encounter CAC in some capacity over the next decade, especially as ICD-11 implementation takes place. SNOMED-CT integration is expected to make NLP more effective as it creates an easier pathway for the technology to recognize diagnosis and treatment synonyms, which is expected to lead to an increase in CAC implementation and use ("Computer Assisted Coding," 2017; Zender, 2019).

By embracing the changes CAC brings to the coding process and evolving with the system, clinical coders can continue to play the vital role within our health care system to ensure Canadians receive the best care possible. The relationship between clinical coders and CAC will be symbiotic; neither will perform to their maximum potential without the other (Stanfill & Marc, 2019).

Despite its relative newness to Canadian facilities, CAC development has seen many advances since its inception decades ago (Nguyen et al., 2018). There is, however, still much room for improvement, particularly

regarding NLP use in inpatient facilities where complex charts and/or charts with a wide variety of patient data not often seen in outpatient facilities present a unique challenge for even the most advanced software. Ongoing research is being done to find ways to make CAC software more effective, and as solutions are discovered, facilities will continue to experience increased benefits (Nguyen et al., 2018). Over the next few years as the demand for health care services increases, Canadian facilities will be able to use this dynamic tool to improve the quality of health data that is continuously used for research, resource utilization planning, and regional/national benchmarking (M. Rasmussen, personal communication, July 9, 2020).

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