Stroke Units, Stroke Registries, and Acute Management (R)evolutions

Carmen Calvello, Lucia Gentili and Roberta Rinaldi

Abstract: Over the past 30 years, stroke units have become the gold standard for inpatient stroke care. Nowadays, all patients hospitalized for stroke should be assessed by trained staff. Improved outcomes have been reported in patients treated in stroke units; therefore, international guidelines were redacted and now highlight that every kind of patient should be treated in stroke units because no subtype, no severity of stroke, and no age group modify the outcomes. These improved outcomes have been assigned to the work of a multidisciplinary team that could better manage early complications. Stroke registers have become a useful tool in clinical practice, facilitating the collection of epidemiological data on stroke and contributing to progressive improvements in the quality of care. There are many ongoing challenges, but the most important contemporary challenge is how to manage stroke unit care in low-income countries.

1. Introduction

Over the past 30 years there has been a revolution in stroke management. The origin of the stroke unit, as a structure capable of welcoming and satisfying the needs of the stroke patient, and the emergence of new professional figures who collaborate in teams have allowed the identification and development of new therapeutic approaches. If once the stroke was interpreted as a "consequence" of progressive cerebral aging, today it represents a neurological disease with some of the greatest therapeutic possibilities able to modify patient outcomes.

2. Stroke Unit Care

2.1. Recent Revolution over the Last 30 Years

During the last few decades of the 20th century, there was a progressive development in the treatment of patients with acute stroke [1].

Stroke was an inevitable event until the mid-1990s; it was believed that medical interventions were little effective, and the absence of dedicated medical specialists determined different management approaches for the disease all over the world.

The development of new vascular imaging techniques, such as computed tomography (CT), magnetic resonance imaging (MRI) and ultrasound (US), highlighted that the diagnosis and treatment of stroke are challenging [1]. Stroke is considered a medical emergency, and the assumption that "time is brain" emphasizes that urgent evaluation and treatment are needed in stroke [2].

Therefore, one of the most important advantages in the management of acute cerebral disease is not pharmacological. Modifying the clinical management approach for stroke has had a beneficial impact on morbidity and mortality [3].

The greatest argument for the need to create an adequate system for the management of stroke has enabled the development of services and the creation of multidisciplinary teams: in this context, in the 21st century, stroke units were established [4].

The 1950s saw the first description of stroke unit settings for the management of stroke patients, made possible by a multidisciplinary team of stroke specialists, followed by the first trials on organized stroke rehabilitation units in the 1960s [5,6], and descriptions of intensive care stroke units in the 1970s [7].

The first large stroke unit trial was published in 1980, involving more than 300 patients [8]; in 1991, the first convincing trial demonstrated that the mortality of stroke patients was lower if they were managed in an organized setting than if they received care in general medicine or neurology departments [9].

In 1993, a meta-analysis was performed on the results of all randomized controlled trials which compared the outcomes of patients hospitalized in stroke units with those hospitalized in general departments. The authors defined a stroke unit "as incorporating a multidisciplinary team of specialists in the care of stroke patients." This definition could be used for both a stroke ward and a mobile stroke team. The review showed that care in a stroke unit setting reduced mortality by 28%, and also reduced the necessity of inpatient care, after a median of 1 year from the event [10].

The Stroke Unit Trialists' Collaboration was established with the goal of improving the results available from stroke unit trials and to update data. The Principal Investigators of all kinds of trials joined a research group. Subsequently, an updated dataset for all randomized controlled trials on stroke unit care was devised by Stroke Unit trialists' collaboration and the Cochrane group, thus confirming a reduction in mortality of 19% (over the first year), as well as reductions in disability and dependency compared with survivors [11].

The crucial point highlighted in all trials is that an expert multidisciplinary team composed of physicians, physiotherapists, nurses, and language and occupational therapists enhances patient care in a stroke unit. This trait may promote the effectiveness of stroke unit care compared with general ward care [3]. Hence, a multidisciplinary team can better manage medical complications that occur in the first week after stroke. Indeed, the difference in death rate between patients hospitalized in a stroke unit and those hospitalized in general medicine is high in the first week, when mortality is often caused by medical complications such as infections, pneumonia, etc. [3]. Furthermore, it seems that intensive physiotherapy and language therapy could improve outcomes in terms of reducing dependency [12].

In the 2000s, several observational studies showed that stroke unit care was associated with improved outcomes, and clinical practice guidelines began to recommend creating stroke units.

The World Stroke Organization has representatives from 12 countries; international guidelines to establish stroke units were redacted in 2014 [13]. This has

been associated with relevant improvements in patient outcomes [14]. The Cochrane group recently confirmed this statement through a systematic review, including 5902 patients, finding moderate-quality evidence that stroke patients managed in stroke units are more likely to survive, be independent, and are less likely to require hospitalization in the first year after stroke. These results are independent of patient age, sex, stroke type, and initial stroke severity [15] (Figure 1).

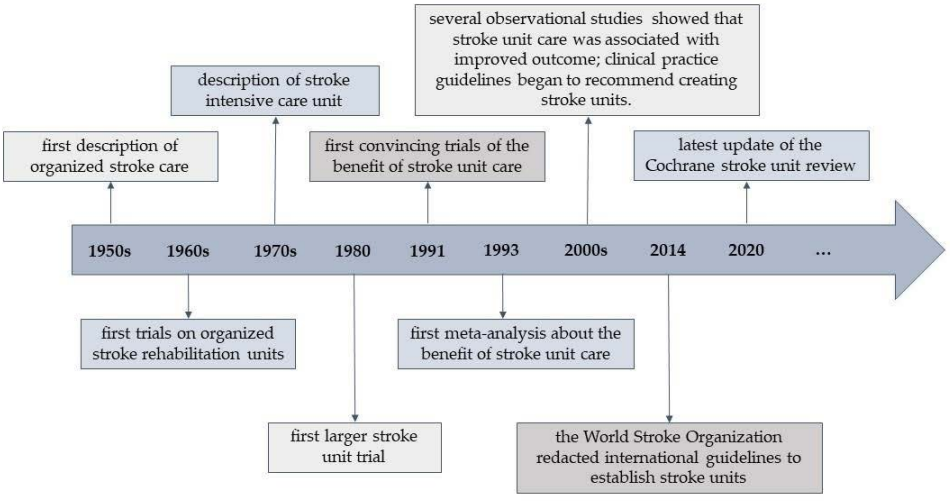

Figure 1. Milestones in the history of stroke units. Source: Authors' compilation based on data from [14].

2.2. The Stroke Registries

A stroke register is a database used for the collection of cerebrovascular-disease-related information. Over a period of substantial developments in stroke management, these registries play a crucial role as a measure of the care efficiency.

The advent of a new technological era, such as the introduction of computer systems in hospitals, has made it possible to collect data on patients with different diagnoses, including cerebrovascular diseases. Computerized databases have facilitated the collection of epidemiological data, such as possible stroke risk factors and stroke subtypes, improving clinicians' knowledge [4].

The first data collection relating to stroke management began in the 1950s, even though the term "registry" was first used in the 1970s in the context of a clinical study on stroke subtypes; subsequently, registers emerged as a central element in stroke research [16].

Over time, registers have become tools for obtaining direct feedback from clinical practice, contributing to continuous improvements in the quality of stroke care, the endorsement of innovative technologies, and the adherence to clinical guidelines by clinicians. Furthermore, the registers have also proved useful for evaluating the

long-term effects of different treatments administered to an extremely heterogeneous population such as that of stroke patients [17].

Worldwide, several study projects are ongoing for the collection of data on stroke management: the comparison between participating centers is a fertile field for continuously improving clinicians' work, as well as being a useful cultural exchange.

The European Register of Stroke (EROS) project is a prospective study with the objective of estimating the impact of stroke and evaluating the quality of stroke care in European populations, analyzing the different diagnostic and therapeutic approaches [17].

In the United States, the Get With The Guidelines—Stroke program, developed by the American Heart Association/American Stroke Association (AHA/ASA), is the largest national registry for improving the quality of care and outcomes for patients affected by strokes and transient ischemic attacks (TIAs).

The use of registries has been strongly recommended by the American Heart Association to support improvements in the quality of service at the hospital level, reducing "barriers" to improving stroke care [17].

As demonstrated from data reported in the literature, we can state that in all countries where a national stroke registry has been adopted, or implemented, there has been a marked improvement in the quality of stroke care and in patient outcomes. These improvements are even more conspicuous for registries that collect patient data from hospitals all over the nation.

2.3. Challenges: The Two Side of the World

Despite all the data indicating successes in stroke unit care, there are still some key areas of challenges and uncertainties. Some components of stroke unit care remain unclear. Several trials studying early mobilization, patient positioning, infection, and glucose management have revealed contrasting results [18–21].

Despite this, the real challenge is in the management of stroke and the establishing of stroke units in low-income countries. In addition, major medical institutes in large cities are not easily accessible for many people living in rural areas.

In these settings, socioeconomic constraints lead to many patients not gaining admission to a hospital. Moreover, some of the essential components of healthcare services are lacking. A recent observational study [22] involving 108 hospitals across 28 different countries highlighted that improved outcomes are also linked to stroke unit care in low-income countries. However, the key challenge is to establish and maintain stroke units in these underdeveloped settings. Many researchers are currently trying to find low-cost protocols of care for these countries (Figure 2).

Figure 2. Stroke Unit of "Josina Machel Hospital" in Luanda, Angola. The Stroke Unit in the Neurology Department was created in 2014, led by a team of Italian Neurologists. Source: photo by author(s). Credit: © M. Paciaroni, used with permission.

3. Conclusions

Nowadays stroke units are the gold standard for acute stroke care and the development of stroke registries has facilitated the collection of clinical and epidemiological data. Nevertheless, discrepancies in stroke units management between Countries around the world is still a challenge.

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