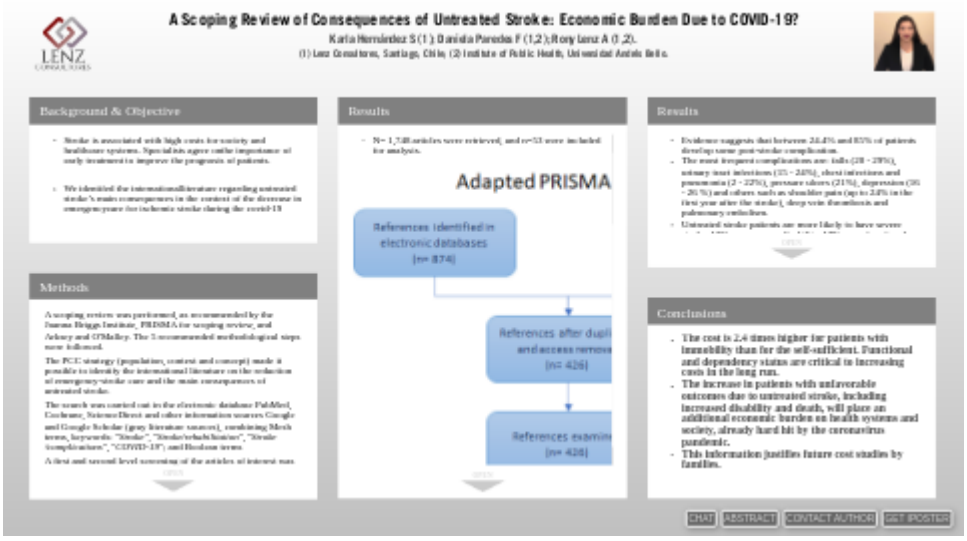
A Scoping Review of Consequences of Untreated Stroke: Economic Burden Due to COVID-19?



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PRESENTED AT:

BACKGROUND & OBJECTIVE

- Stroke is associated with high costs for society and healthcare systems. Specialists agree onthe importance of early treatment to improve the prognosis of patients.

- We identifed the internationalliterature regarding untreated stroke’s main consequences in the context of the decrease in emergencycare for ischemic stroke during the covid-19 outbreak.

METHODS

A scoping review was performed, as recommended by the Joanna Briggs Institute, PRISMA for scoping review, and Arksey and O'Malley. The 5 recommended methodological steps were followed.

The PCC strategy (population, context and concept) made it possible to identify the international literature on the reduction of emergency-stroke care and the main consequences of untreated stroke.

The search was carried out in the electronic database PubMed, Cochrane, ScienceDirect and other information sources Google and Google Scholar (gray literature sources), combining Mesh terms, keywords: *"Stroke",* "*Stroke/rehabilitation*", "*Stroke /complications*", "*COVID-19*"; and Boolean terms

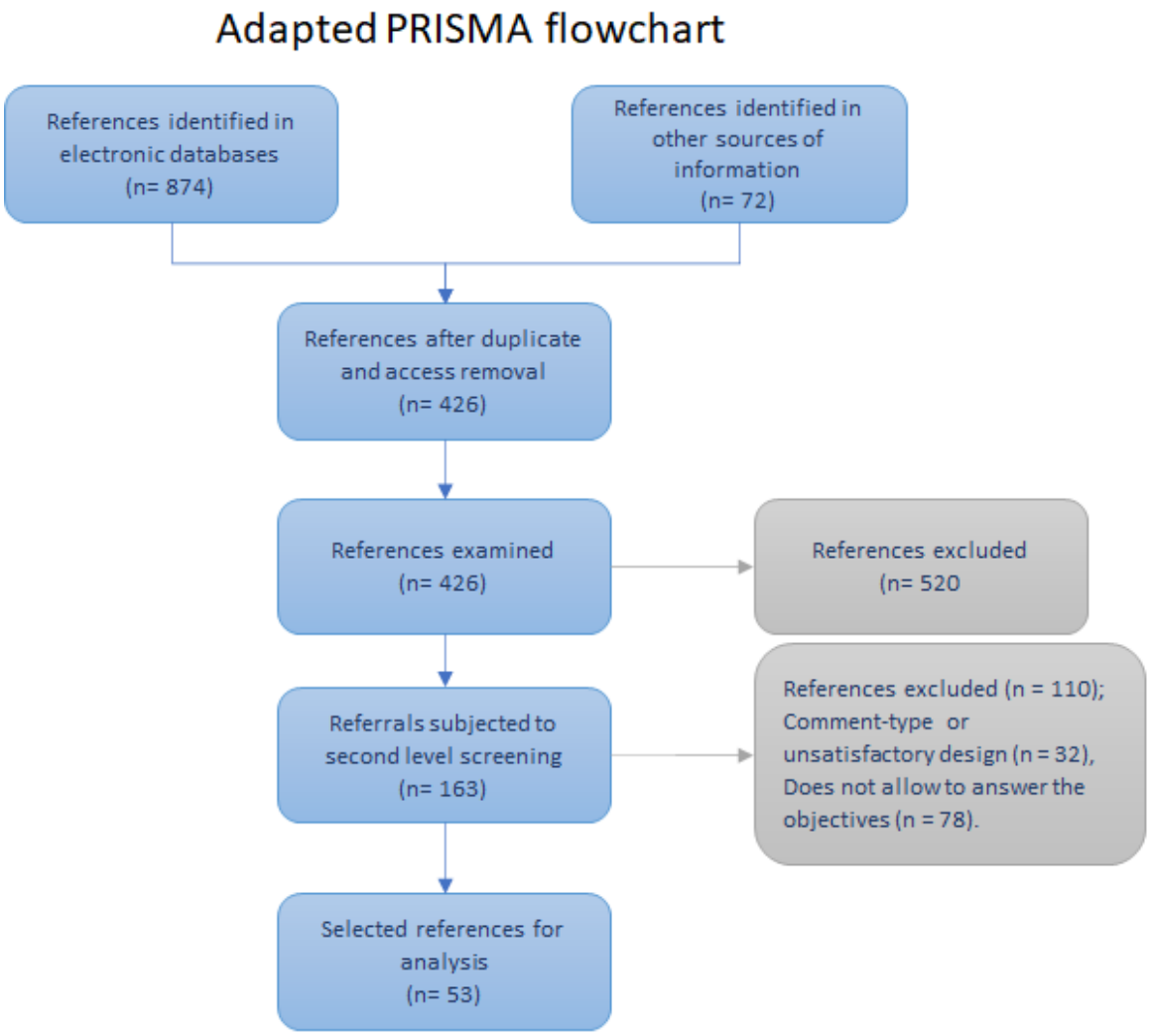
A first and second level screening of the articles of interest was carried out. First, the inclusion and exclusion criteria were applied to the title and abstract of the selected evidence, and then to the full text.

Publication, selection and observer biases are controlled throughout the work:

- Publication bias will be managed by including identified gray literature.
- Selection bias is controlled by defining MeSH and free concepts, contexts and terms in advance, as well as: search filters and evidence selection and exclusion criteria.
- Observer bias is controlled in the evidence analysis phase, specifically through the coding of the selected articles, thus making a "blind" identification of the literature, one of the possible codings not considering the author.

RESULTS

- N= 1,748 articles were retrieved, and n=53 were included for analysis.



- International data show a decrease in emergency care (20% less) in different countries, endovascular procedures such as reperfusions, mechanical thrombectomies (up to 32% less) and indications for thrombolysis (5.5% less).
- Fewer admissions for stroke (36.9% to 46% less) are temporarily related to the onset of the pandemic and quarantines.

Main results on variations in emergency care for stroke during the COVID-19 pandemic

Category	Country, health center	Change reported
Emergency calls and alerts	EE. UU., Connecticut. 3 hospitals.	Decrease of 30% (2.6 fewer calls per week).
	Reino Unido, Ambulance Service University NHS Foundation Trust.	Unchanged.
	Canadá, Ontario.	20% drop in emergency code activations by stroke.
	EE.UU., 19 hospitals in Ohio.	Decrease in stroke alerts with a rate of 0.70 (95% CI, 0.60-0.28) during the COVID period.
Admissions	Dinamarca	Decrease of 12.7% in the confinement period, versus 2017-2019.
	Brasil, Joinville.	36.4% reduction in stroke admissions.
	España, Noreste.	Decrease in weekly average admissions by ACV (124 vs. 173, p<0.001).
	Alemania, 4 specialist hospitals.	Significantly decreased by 40% and 46%.
	Noruega, Akershus University Hospital.	6.8 income per week less during confinement.
	China, Beijín.	45.6% reduction in income in the lockdown period, with more reductions for hemorrhagic ACV (69.0%) compared to ischemic ACV (42.9%). There were further reductions in hospitals designated by COVID-19 (52.6%) compared to non-designated hospitals (41.8%).
Number of health visits	EE.UU., Ohio, Kentucky e Indiana.	Decrease of 39%.
	EE.UU.	20% decrease in visits to the emergency department for stroke.
Endovascular procedures	Alemania, Bavaria.	Significant 5.5% reduction in rtPA indications versus the previous three years.
	Francia, 32 centros.	21% decrease in mechanical thrombectomy volumes in the pandemic period.
	Francia, EE.UU., Alemania, China, Italia, España.	The number of reperfusions and mechanical thrombectomy was reduced by 31% and 22%, respectively, during the pandemic.
	Reino Unido, 27 centros.	27.7% decrease in the number of thrombectomies performed.
	17 hospitals: 6 from Francia, 3 from Portugal, 2 from Italia, 2 from Suiza, 1 from España, 1 from Alemania, 1 from Canadá y 1 from EE.UU.).	Decrease of 32% between pre-confinement (9.0 [95% CI, 7.8-10.1]) and after COVID-19 confinement (6.1 [95% CI, 4.5–7.7]).
	EE.UU., 19 hospitals in Ohio.	Thrombolysis also decreased with rate ratios, 0.52 (95% CI, 0.28–0.97) but thrombectomy was unchanged with rate ratios, 0.93 (95% CI, 0.52–1, 62).
Number of neurology beds	España, Madrid.	89.4% reduction due to COVID-19 pandemic.
Times	EE. UU., Hospital Langone Health from Nueva York.	Longer door-to-head computed tomography time (16 versus 12 minutes; p = 0.05) and longer door-to-groin puncture times (79.5 versus 71 minutes, p = 0.06).
	Noruega, Akershus University Hospital.	Increased OR of 2.05 (95% CI: 1.10-3.83; p = 0.024) for not arriving at the hospital within 4.5 hours during the lockdown compared to the period before the lockdown.

RESULTS

- Evidence suggests that between 24.4% and 85% of patients develop some post-stroke complication.
- The most frequent complications are: falls (20 - 29%), urinary tract infections (15 - 24%), chest infections and pneumonia (2 - 22%), pressure ulcers (21%), depression (16 - 26 %) and others such as shoulder pain (up to 24% in the first year after the stroke), deep vein thrombosis and pulmonary embolism.
- Untreated stroke patients are more likely to have severe stroke, 13% more severe disability, 12% more functional dependence at 6 - 12 months ($p < 0.001$), higher costs of rehabilitation and hospital stay (> 15% more). Furthermore, more cognitive disability (16.6% more likely to have stroke recurrence ($p = 0.006$)) and 4% to 6% more likely to die, compared to patients treated with thrombolysis (r-tPA).

CONCLUSIONS

- **The cost is 2.4 times higher for patients with immobility than for the self-sufficient. Functional and dependency status are critical to increasing costs in the long run.**
- **The increase in patients with unfavorable outcomes due to untreated stroke, including increased disability and death, will place an additional economic burden on health systems and society, already hard hit by the coronavirus pandemic.**
- **This information justifies future cost studies by families.**

ABSTRACT

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METHODS
A Scoping Review was conducted following the PCC strategy (population, context, and concept)to identify the international literature regarding the decrease in stroke-emergency care and the mainconsequences of untreated stroke. The search was carried out in PubMed, Cochrane, ScienceDirect,Google, and Google Scholar, combining Mesh terms and Boolean terms.

RESULTS
N= 1,748 articles were retrieved, and n=53 were included for analysis. International data shows adecrease in emergency care (20% less), endovascular procedures (up to 32% less), and indications forthrombolysis (5.5% less). Fewer admissions for stroke (46% less) are temporally related to the pandemic'sonset and quarantines. Untreated stroke patients are more likely to present severe stroke, 13% moresevere disability, 12% more functional dependence at 6-12 months ($p<0.001$), higher rehabilitation costsand hospital length-of-stay (>15% more), more cognitive disability (16.6% more likely for stroke recurrence($p=0,006$)) and 4-6% more likely to die, compared to patients treated with thrombolysis (r-tPA).

CONCLUSIONS
The increase in patients with unfavorable outcomes due to untreated stroke, includingincreased disability and death, will put an added economic burden on healthcare systems and society,already greatly a□ected by the coronavirus pandemic. This information justi□es carrying-out future studiesof costs borne by families.