



User manual
for
The ABC Stroke Risk Score Calculator

Version 3, June 2024, in English

1. The Evidencio platform

The Evidencio platform facilitates the creation, use, validation and implementation of medical prediction models and clinical decision support tools. This user manual specifically relates to the ABC Stroke Risk Score Calculator. The User Manual can also be referred to as the Instructions For Use (IFU).

Throughout this manual CE-marked content and the term medical device are used interchangeably.

2. Disclaimer

Evidencio provides information, models, calculators, equations and algorithms (tools) intended for use by healthcare professionals. Some of these tools have been certified as CE-medical devices. For such CE-marked content the 'Official Legal Disclaimer for CE-marked content' applies. All other content and tools provided by Evidencio are explicitly only covered by the 'Official Legal Disclaimer for non CE-marked content' both are available here:

<https://www.evidencio.com/disclaimer>

3. Warnings



Warnings for CE-marked content

Calculations alone should never dictate patient care, and are no substitute for professional judgement.

This tool is only to be used by physicians in a clinical setting, and is not for patient use.

Always read the intended use before using this tool.

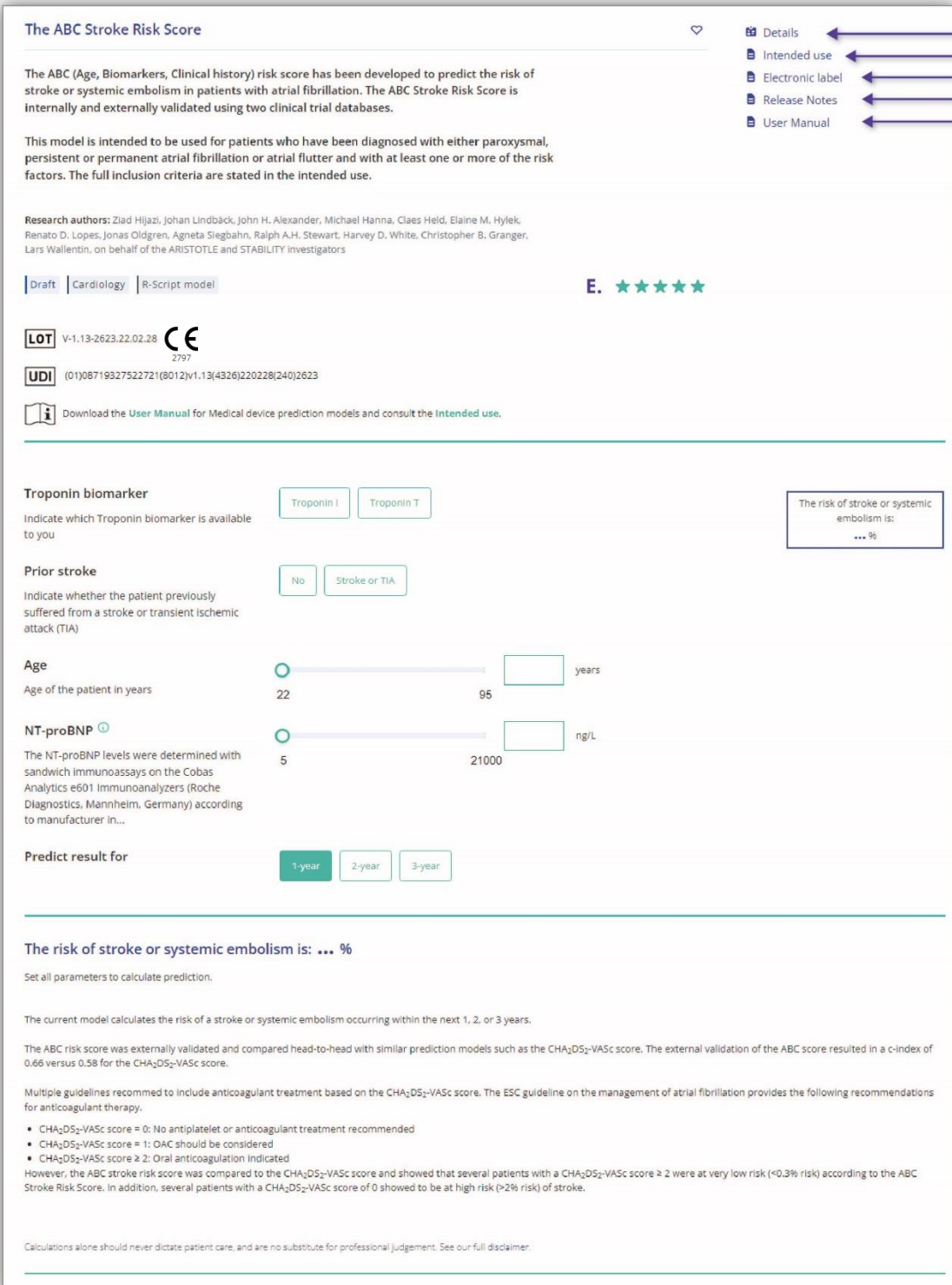
Before reading the result, double check the filled in values to prevent errors.

Results that concern risk percentages, do not guarantee certain outcomes. When there is a risk present, do not expect an event to not occur at all, even if the risk is very small.

This model is only intended for use in settings where the usage and result of a model are never urgently needed.

4. Model landing page

The medical device model on the Evidencio platform is shown in Figure 1. The model landing page contains the following sections, that are indicated in Figure 1.



A. The ABC Stroke Risk Score

B. The ABC (Age, Biomarkers, Clinical history) risk score has been developed to predict the risk of stroke or systemic embolism in patients with atrial fibrillation. The ABC Stroke Risk Score is internally and externally validated using two clinical trial databases.

This model is intended to be used for patients who have been diagnosed with either paroxysmal, persistent or permanent atrial fibrillation or atrial flutter and with at least one or more of the risk factors. The full inclusion criteria are stated in the intended use.

C. **Research authors:** Ziad Hijazi, Johan Lindbäck, John H. Alexander, Michael Hanna, Claes Held, Elaine M. Hylek, Renato D. Lopes, Jonas Oldgren, Agneta Siegbahn, Ralph A.H. Stewart, Harvey D. White, Christopher B. Granger, Lars Wallentin, on behalf of the ARISTOTLE and STABILITY investigators

D. | Draft | Cardiology | R-Script model

E. ★★★★★

F. **LOT** V-1.13-2623.22.02.28 **CE**
2797

G. **UDI** (01)08719327522721(8012)v1.13(4326)220228(240)2623

L. Download the **User Manual** for Medical device prediction models and consult the **Intended use**.

M.

Troponin biomarker

Indicate which Troponin biomarker is available to you

Troponin I Troponin T

Prior stroke

Indicate whether the patient previously suffered from a stroke or transient ischemic attack (TIA)

No Stroke or TIA

Age

Age of the patient in years

22 years

NT-proBNP

The NT-proBNP levels were determined with sandwich immunoassays on the Cobas Analytics e601 immunoanalyzers (Roche Diagnostics, Mannheim, Germany) according to manufacturer in...

5 ng/L

Predict result for

1-year 2-year 3-year

N.

The risk of stroke or systemic embolism is: ... %

Set all parameters to calculate prediction.

The current model calculates the risk of a stroke or systemic embolism occurring within the next 1, 2, or 3 years.

The ABC risk score was externally validated and compared head-to-head with similar prediction models such as the CHA₂DS₂-VASc score. The external validation of the ABC score resulted in a c-index of 0.66 versus 0.58 for the CHA₂DS₂-VASc score.

Multiple guidelines recommend to include anticoagulant treatment based on the CHA₂DS₂-VASc score. The ESC guideline on the management of atrial fibrillation provides the following recommendations for anticoagulant therapy.

- CHA₂DS₂-VASc score = 0: No antiplatelet or anticoagulant treatment recommended
- CHA₂DS₂-VASc score = 1: OAC should be considered
- CHA₂DS₂-VASc score ≥ 2: Oral anticoagulation Indicated

However, the ABC stroke risk score was compared to the CHA₂DS₂-VASc score and showed that several patients with a CHA₂DS₂-VASc score ≥ 2 were at very low risk (<0.3% risk) according to the ABC Stroke Risk Score. In addition, several patients with a CHA₂DS₂-VASc score of 0 showed to be at high risk (>2% risk) of stroke.

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H. Details

I. Intended use

J. Electronic label

K. Release Notes

L. User Manual

Figure 1. The model landing page.

A. Model title

This is the title and name of the model.

B. Model description

This is a short description of the model.

C. Research authors

These are the research authors of the paper that originally published the model.

D. Model tags

These are the tags that are assigned to the model. Evidencio has the following status tags: "Draft", "Public", "Private", "Under review". Evidencio has the following model type tags: "Composite model", "Sequential model", "API model". Evidencio has the following calculation method tags: "Linear model", "Logistic regression", "Cox regression", "RScript" and "Custom model". Next to this, there are tags that indicate the specialty e.g. "Cardiology".

E. Model rating

Evidencio can award up to 5 stars to each model, these stars are awarded when:

1. All model details are provided;
2. A TRIPOD form is added to the supporting publications;
3. An internal review is added to the supporting publications;
4. An external review is added to the supporting publications; and
5. A peer review is added to the supporting publications.

Under the "Details button", indicated by H, details are given to which of these stars are awarded for which reason. The ABC Stroke Risk Score Calculator has 5 stars.

F. LOT number

The LOT number indicated the model version, the model identifier, and the model publication date. Publication date is indicated as YY.MM.DD.

Additionally, the CE mark is displayed next to the LOT number. This way, medical devices can be easily recognized.

G. UDI number

The UDI number is an international tool that helps users identify and find information on products. UDI stands for Unique Device Identifier. Evidencio's UDIs have the following format:

(01)UDI-DI number(8012)versionnumber(4326)releasedate(240)identificationnumber

The UDI-DI number is a unique numeric code. For each medical device of Evidencio, a unique UDI-DI is ascribed. This UDI-DI is used as an "access key" for information stored in a unique device identification database (UDID). Information on Evidencio's medical devices can be found by searching for the UDI-DI number in the following data base:

<https://gepir.gs1.org/index.php/search-by-gtin>

H. Details button

On the top right of the model page, several clickable buttons are displayed that show a pop-up when clicked. The first button opens a pop-up concerning additional information about the model. This pop-up has three sections: Details, Study characteristics and Supporting publications & related files.

Details

The first part of the additional information concerns the details of the model as shown in Figure 2.

Additional information on the rating of a model can be found by hovering over the “i” icon, next to the stars.

Details

Model author	T. A. Hueting	Rating	★ ★ ★ ★ ★ ⓘ
Model ID	2187	Status	Private
Version	3.0	Share	f t in
Revision date	2021-05-18		
Specialty	Cardiology		
Model type	R-Script model <small>(Calculation)</small>		
MeSH terms	<ul style="list-style-type: none"> • Atrial Fibrillation • Cardiovascular Stroke • Cardiovascular Stroke 		

Figure 2. The model details.

Study characteristics

Below the ‘Details section’ the section labeled ‘Study characteristics’ provides information the characteristics of the patient data used to derive and validate the model. Additional information is provided on the methods used to develop and/or validate the model.

An important part of the Study characteristics is the information on Supporting publications and related files. These sections can be found at the bottom of the Details-pop-up as shown in Figure 3.

Tags are attached to the different files to identify their link with the model. Examples of relevant tags are a.o.; “Peer review”, “Internal validation”, “External validation”, and “TRIPOD”. Publications that have the tags: “Internal validation” or “External validation”, contain the performance characteristics of the device.

These tags are considered important, because the availability of particular information covered by the above mentioned tasks provide insight into the quality of the model development process and the model itself. As a completeness of information and quality indicator a model receives a certain number of stars when these labels can be assigned to relevant files or references.

Supporting Publications	Tags
<p>Title or description</p> <p>The ABC (age, biomarkers, clinical history) stroke risk score: a biomarker-based risk score for predicting stroke in atrial fibrillation. DOI: 10.1093/eurheartj/ehw054</p>	<ul style="list-style-type: none"> External validation Internal validation Peer review Tripod
<p>Performance and Validation of a Novel Biomarker-Based Stroke Risk Score for Atrial Fibrillation DOI: 10.1161/CIRCULATIONAHA.116.022802</p>	<ul style="list-style-type: none"> External validation Paper
<p>Performance of the ABC Scores for Assessing the Risk of Stroke or Systemic Embolism and Bleeding in Patients With Atrial Fibrillation in ENGAGE AF-TIMI 48 DOI: 10.1161/CIRCULATIONAHA.118.038312</p>	<ul style="list-style-type: none"> External validation Paper
<p>High-Sensitivity Troponin I for Risk Assessment in Patients With Atrial Fibrillation DOI: 10.1161/CIRCULATIONAHA.113.006286</p>	<ul style="list-style-type: none"> Information on topic
<p>N-Terminal Pro-B-Type Natriuretic Peptide for Risk Assessment in Patients With Atrial Fibrillation DOI: 10.1016/j.jacc.2012.11.082</p>	<ul style="list-style-type: none"> Information on topic
<p>Meta-analysis: Antithrombotic Therapy to Prevent Stroke in Patients Who Have Nonvalvular Atrial Fibrillation DOI: 10.7326/0003-4819-146-12-200706190-00007</p>	<ul style="list-style-type: none"> Information on topic
<p>ESC guideline - management of atrial fibrillation</p>	<ul style="list-style-type: none"> Information on topic

Figure 3. Supporting publications.

I. Intended use button

The intended use and (medical) purpose of the model can be found under the button: 'Intended use'. Among other things, the intended use indicates the inclusion criteria of the medical device. Furthermore, the intended use comments on the appropriate use of the model regarding the intended use environment, intended users, and intended patient population (inclusion criteria). For the ABC Stroke Risk Score the following intended use is described:

Intended use

The ABC Stroke Risk Score calculator is intended to support clinical decision making by informing clinical management on the estimated risk that an individual patient diagnosed with atrial fibrillation or atrial flutter may suffer a stroke or systemic embolism within the next 1, 2, or 3 years.

The calculator combines patient data (age) with clinical data (prior stroke) and lab results (Troponin I, Troponin T, NT-proBNP) to calculate the estimated risks.

The calculator is intended to be used by physicians in a clinical setting, in combination with other information related to the patient (such as clinical history, appearance, comorbidities, other scores, patient preferences, etc.) used in the context of the physician's decision to prescribe anticoagulant medication or to change an existing prescription. In addition, the calculator can be used repeatedly at patient follow-ups to assess the risk over time.

The ABC Stroke Risk Score on Evidencio does not provide any recommendations regarding the type or dose of anticoagulant treatment, and does not provide recommendations regarding contra-indications for specific anticoagulant treatment options.

Clinical benefit

The ABC Stroke Risk Score indicates whether the physician should consider the administration of anticoagulation. The ABC Stroke Risk Score showed improved stratification between low and high risk patients, accurate risk estimations on model calibration, and improved net clinical benefit on decision curve analysis compared to the guideline recommended CHA2DS2-VASc score.

Inclusion criteria

The calculator is intended to be used for patients who have been diagnosed with either paroxysmal, persistent or permanent atrial fibrillation or atrial flutter **and** with at least one or more of the following risk factors:

- Age >60;
- Diabetes Mellitus;
- A high-density lipoprotein cholesterol level of <1.03 mmol/L;
- Smoker of five or more cigarettes per day;
- Moderate renal dysfunction (≥ 30 and ≤ 59 mL/min);
- polyvascular arterial disease;
- prior stroke, TIA, or systemic embolism;
- Heart failure;
- Hypertension requiring pharmacological treatment.

Caution should used for patients with active cancer, as this algorithm does not take patient cancer characteristics into account, and active cancer may increase both bleeding and stroke risks

User profile

The calculator should **not** be used by patients.

The calculator may be used by physicians and qualified medical specialists in a clinical setting. Healthcare professionals do not require additional training prior to the use of the medical device.

Intended use environment

The calculator can be used as made available on the Evidencio platform in any modern web-browser on personal computers, mobile devices, or tablet PCs, and in the mobile App provided by Evidencio. Furthermore, the calculator can be used through the Evidencio iFrame representation of the calculator, as an embedded view, provided that the specific Evidencio guidelines for iFrame implementations of this model are adhered to. The model is only intended for use in settings where the usage and result of a model are never urgently needed.

Functioning, physical principle

The calculator's underlying mathematical formula is a Cox-regression.

J. Electronic label button

The electronic label button opens a pop-up with the location and address of Evidencio, the LOT number, the UDI number, the CE-mark, the medical device logo and a download link for the declaration of conformity of the medical device. The example of the electronic label is shown in Figure 4.

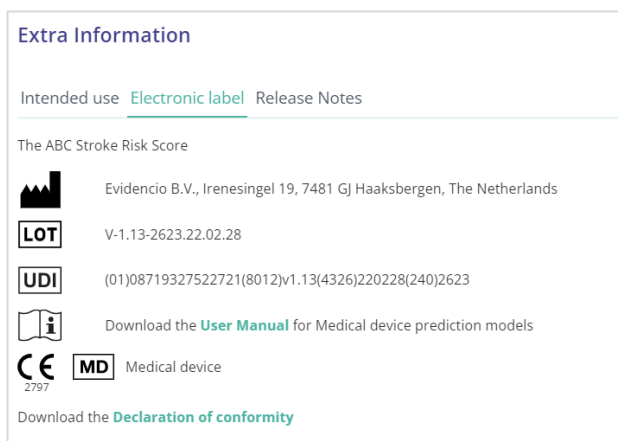


Figure 4. Example of the electronic label

K. Release notes

The 'Release Notes' button opens a pop-up with the latest release notes of the model. Here you can find what has changed over the last versions of the model. Additionally, if there are any known residual anomalies the user should be aware of, they are listed here.

L. User Manual

This user manual can be found in three places: 1) under the short description, 2) on the right of the model page, and 3) in the electronic label. Additionally, all versions of the user manual can be found in the general page for all user manuals for medical devices. The page can be found under the 'About' drop-down menu button as shown in Figure 5. The user manual page is shown in Figure 6.

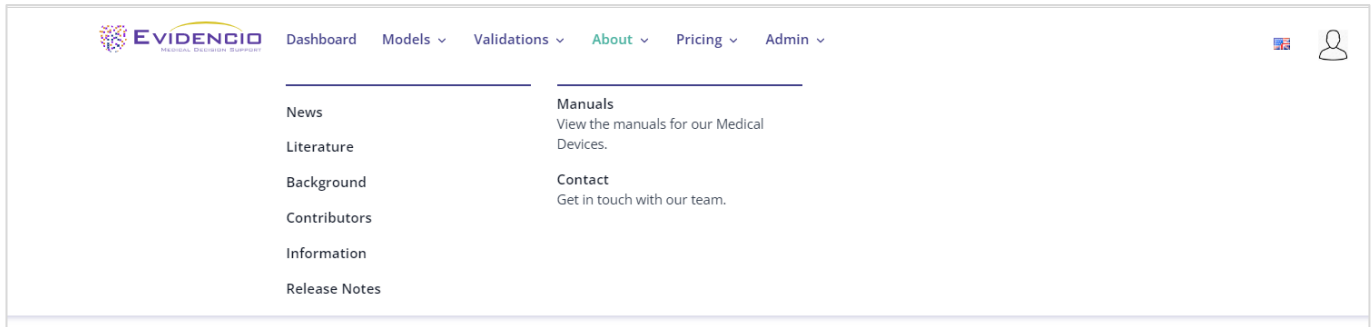


Figure 5. The drop-down menu where the user manual page can be found.

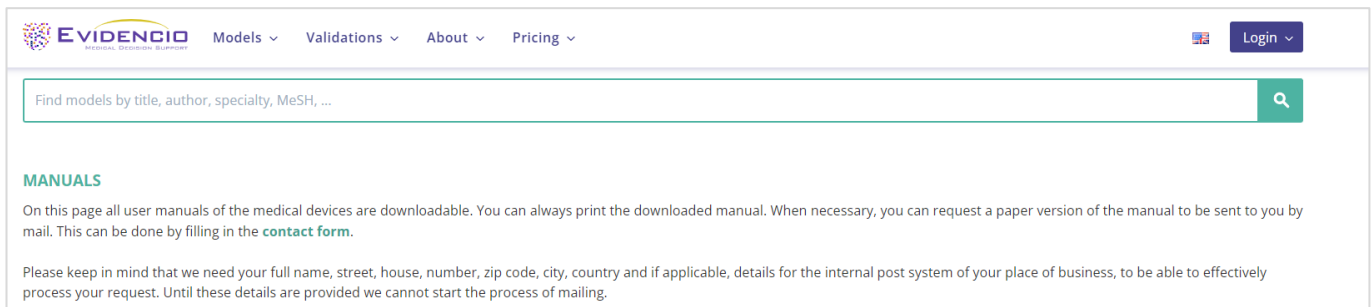


Figure 6. The user manual page for all user manuals.

You (The user) can always print this downloaded manual. When necessary, you can request a paper version of the manual to be sent to you by mail. Evidencio's contact details are listed in Chapter 6 of this user manual.

M. Input section

The Evidencio platform allows two separate input variables; categorical, and continuous variables.

Categorical variables

In the example shown in Figure 7 and 8, the **Prior stroke** variable concerns a categorical variable. The patient status can be entered by clicking on either button. The selected button changes to green, as seen in Figure 8.

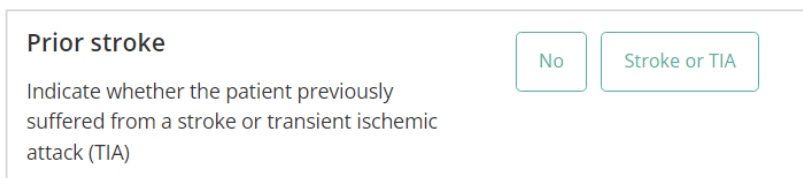


Figure 7. The variable for Prior stroke, where no button has been clicked, and thus no input has been provided by the user.

Prior stroke

Indicate whether the patient previously suffered from a stroke or transient ischemic attack (TIA)

Figure 8. The variable for Prior stroke, where the "Stroke or TIA" button has been clicked.

Continuous variables

In the example shown in Figure 9, the **Age** variable, exemplifies a continuous variable. The plausible ranges for the variables are defined by the model author. For example, the model is not suitable for patients younger than 22, or older than 95. Thus, the model only allows input of ages for patients between the ages of 22 to 95.


The details for a patient can be entered by sliding the button to the correct value, or by entering the correct value in the box on the right-hand side (i.e., where the 65 is entered for **Age**).

Age

Age of the patient in years

22

95



65

years

Figure 9. The variable for age, where "65" has been entered.

Details on variable measurements


Directly underneath the name for each variable, additional details can be provided on the methods required to enter the correct value for each variable. In Figure 10, the details below **Troponin I** explain how the biomarker is measured in patients used to develop the model. Hovering the mouse over the green "i" next to **Troponin I** will display additional details on the measurement of that specific variable.

Troponin I ⓘ

For the development of the ABC stroke risk score the high sensitivity Troponin I levels were determined with sandwich immunoassays on the ARCHITECT i1000SR (Abbott Diagnostics...

2

1000



ng/L

Figure 10. An example on how additional information can be provided for a variable.

N. Result section

At the bottom of the page, the results of the model are shown.

Result calculation

When all variables are filled in, a result will be calculated. No risk is displayed until all variables are filled in. The result section indicates "Set all parameters to calculate prediction."

Result interpretation

In the result interpretation, a risk stratification is given based on the risk score. The patient is classified as high risk, medium risk or low risk. Furthermore, some explanation about the model is given including the c-index of the external validation. This information is also stated here below:

The current model calculates the risk of a stroke or systemic embolism occurring within the next 1, 2, or 3 years.

The ABC risk score was externally validated and compared head-to-head with similar prediction models such as the CHA2DS2-VASc score. The external validation of the ABC score resulted in a c-index of 0.66 versus 0.58 for the CHA2DS2-VASc score.

Multiple guidelines recommend to include anticoagulant treatment based on the CHA2DS2-VASc score. The ESC guideline on the management of atrial fibrillation provides the following recommendations for anticoagulant therapy.

- CHA2DS2-VASc score = 0: No antiplatelet or anticoagulant treatment recommended
- CHA2DS2-VASc score = 1: OAC should be considered
- CHA2DS2-VASc score \geq 2: Oral anticoagulation indicated

However, the ABC stroke risk score was compared to the CHA2DS2-VASc score and showed that several patients with a CHA2DS2-VASc score \geq 2 were at very low risk (<0.3% risk) according to the ABC Stroke Risk Score. In addition, several patients with a CHA2DS2-VASc score of 0 showed to be at high risk (>2% risk) of stroke.

[Relevant information for correct use of the model](#)

At the bottom of the page, there is a link to Evidencio's terms and conditions of use, the privacy policy, and the disclaimer.

5. Use of Medical devices

In general, and unless explicitly stated otherwise, CE-marked tools on Evidencio are only to be used by physicians in a clinical setting, and are not for patient use.

To use the tool, Evidencio requires a stable internet connection and runs on the following devices:

- Personal computers or laptops using the following browsers:
 - Safari (the latest three versions)
 - Chrome (the latest three versions)
 - Firefox (the latest three versions)
 - Edge (the latest three versions)
- Tablets or smartphones running on the next operating systems:
 - IOS (the latest three versions)
 - Android (the latest three versions)

The medical device cannot be used in combination with Internet Explorer. The personal computers, laptops, tablets or smartphones used should at least be able to have an internet connection and use the browsers mentioned above. The minimal screen resolution should be 800x600.

Furthermore, the model may be used through the Evidencio iFrame representation of the calculator, as an embedded view, provided that the specific Evidencio guidelines for iFrame implementations of that model are adhered to.

The Evidencio SaMD models can be used with any browser settings that don't distort the regular display of websites, with a 50% to 500% zoom rate, and at a display resolution starting from 800x600. However, factory recommended browser settings, 100% zoom rate and regular display resolution are recommended.

This model is only intended for use in settings where the usage and result of a model are never urgently needed.

6. Manufacturer details

Any serious incident that has occurred in relation to the device should be reported to the manufacturer and the competent authority of the country in which you, the reader, are established. A competent authority is the institute that governs all issues related to medical devices in a country.

Contact details of your competent authority can be found here: <https://www.ema.europa.eu/en/partners-networks/eu-partners/eu-member-states/national-competent-authorities-human>

Please contact Evidencio when you suspect any malfunction or changes in the performance of a medical device. Do not use the device until Evidencio replies to your message that it is safe to start using it again.

Contact details of Evidencio:



Evidencio B.V., Irenesingel 19, 7481 GJ Haaksbergen, The Netherlands
www.evidencio.com
tel: +31 53 85195 08
e-mail: info@evidencio.com