Guidelines on Risk Classification of Standalone Medical Mobile Applications and Qualification of Clinical Decision Support Software (CDSS)

Medical Devices Cluster

APRIL 2022

CONTENTS

REVISION HISTORY

Guidelines Version (Effective Date)	Revision
Risk Class SAMD-CDSS: First Release (29 April 2022)	R1

Changes and updates made in each document revision are annotated with or within the arrow symbol "►". Deletions may not be shown.

INTRODUCTION
Objective

- This guideline takes reference from the IMDRF's Framework for Software as a Medical Device (SaMD)[1] to determine the risk classification of Standalone Medical Mobile Applications that are Medical Devices (commonly referred as SaMD)

- This guideline also provides clarity on the qualification of Clinical Decision Support Software (CDSS) as regulated medical devices or otherwise, as well as the current regulatory approach and requirements for such software that are regulated by HSA

- The guidelines reflect HSA's current policy stance and practice, and should not be misconstrued as new regulatory controls on software medical devices and CDSS

[1] IMDRF, Software as a Medical Device (SaMD): Possible Framework for Risk Categorization and Corresponding Considerations, 18 September 2014

INTRODUCTION
Definitions

Standalone Medical Mobile Application

A software and/or mobile application that is intended to be used for one or more medical purposes that function by itself and are not intended for use to control or affect the operation of other hardware medical devices

NOTE: *Standalone Medical Mobile Application is intended to run on general computing device (e.g. laptop, tablet, desktop and etc.).* These are commonly referred to as Software as Medical Devices (SaMD)

Intended Purpose/ Intended Use *(as defined in the Health Products (Medical Devices) Regulations)*

In relation to a medical device or its process or service, means the objective intended use or purpose, as reflected in the specifications, instructions and information provided by the product owner of the medical device

CLASSIFICATION
Risk Classification Framework

The Risk Classification Framework for Standalone Medical Mobile Applications (i.e. SaMD) will take into consideration the following:

i. The **significance of information provided by the standalone medical mobile application** to healthcare decision: to treat or diagnose, to drive clinical management, or to inform clinical management and;

ii. The **state of the patient's healthcare situation or condition**: critical, serious, or non-serious

iii. Existing **GN-13 Guidance on Risk Classification** of General Medical Devices and the risk classification rules therein

IMDRF, Software as a Medical Device (SaMD): Possible Framework for Risk Categorization and Corresponding Considerations, 18 September 2014

Treat or to diagnose

Treating and diagnosing infers that the information provided by the Standalone Medical Mobile Application will be used to take an immediate or near term action:

- To treat/prevent or mitigate by connecting to other medical devices, medicinal products, general purpose actuators or other means of providing therapy to a human body
- To diagnose/screen/detect a disease or condition (i.e., using sensors, data, or other information from other hardware or software devices, pertaining to a disease or condition)

Drive clinical/patient management

Driving clinical/patient management infers that the information provided by the Standalone Medical Mobile Application will be used to aid in treatment, aid in diagnosis, to triage or identify early signs of a disease or condition, will be used to guide next diagnostics or next treatment interventions:

- To aid in treatment by providing enhanced support to safe and effective use of medicinal products or a medical device
- To aid in treatment as an adjunct to standard clinical treatment
- To aid in diagnosis by analyzing relevant information to help predict risk of a disease or condition or as an aid to making a definitive diagnosis
- To triage or identify early signs of a disease or conditions

Inform clinical/patient management

Informing clinical/patient management infers that the information provided by the Standalone Medical Mobile Application will be used:

- To inform of options for treating, diagnosing, preventing, or mitigating a disease or condition
- To provide clinical information by aggregating relevant information (e.g., disease, condition, drugs, medical devices, population, etc.)

Critical situation or condition

Situations or conditions where accurate and/or timely diagnosis or treatment action is vital to avoid death, long-term disability or other serious deterioration of health of an individual patient or to mitigating impact to public health. The Standalone Medical Mobile Application is considered to be used in a critical situation or condition where:

- The type of disease or condition is:
  - Life-threatening state of health, including incurable states
  - Requires major therapeutic interventions
  - Sometimes time critical, depending on the progression of the disease or condition that could affect the user's ability to reflect on the output information
- Intended target population is fragile with respect to the disease or condition (e.g., pediatrics, high risk population, etc.)
- Intended for specialized trained users

Note: Devices intended for specialized trained users refer to devices that is to be used by an individual who has undergone such training on the safe and efficacious use of the medical device as is necessary.

Serious situation or condition

Situations or conditions where accurate diagnosis or treatment is of vital importance to avoid unnecessary interventions (e.g., biopsy) or timely interventions are important to mitigate long term irreversible consequences on an individual patient's health condition or public health. The Standalone Medical Mobile Application is considered to be used in a serious situation or condition when:

- The type of disease or condition is:
  - Moderate in progression, often curable
  - Does not require major therapeutic interventions
  - Intervention is normally not expected to be time critical in order to avoid death, long-term disability or other serious deterioration of health, whereby providing the user an ability to detect erroneous recommendations
- Intended target population is NOT fragile with respect to the disease or condition
- Intended for either specialized trained users or lay users

Non-Serious situation or condition

Situations or conditions where an accurate diagnosis and treatment is important but not critical for interventions to mitigate long term irreversible consequences on an individual patient's health condition or public health. The Standalone Medical Mobile Application is considered to be used in a non-serious situation or condition when:

- The type of disease or condition is:
  - Slow with predictable progression of disease state (may include minor chronic illnesses or states),
  - May not be curable; can be managed effectively,
  - Requires only minor therapeutic interventions, and
  - Interventions are normally noninvasive in nature, providing the user the ability to detect erroneous recommendations
- Intended target population is individuals who may not always be patients
- Intended for use by either specialized trained users or lay users

Non-IVD Standalone Medical Mobile Applications (SaMD)

Risk Classification Table

State of healthcare situation or condition	Significance of information provided by SaMD to healthcare decision		
	Treat or diagnose	Drive clinical / patient management	Inform clinical / patient management
Critical	C	C	B
Serious	C	B	A
Non-serious	B	A*	A

* Standalone Medical Mobile Applications will be classified as Class B if intended to image, measure or monitor a physiological process to drive clinical/patient management; consistent with rule 10(i) of GN-13

To determine the risk classification of IVD Standalone Mobile Application please refer to GN-14 Guidance on the Risk Classification of IVD Medical Devices

CLASSIFICATION
Examples

Software intended for healthcare professionals to predict the risk of developing migraine by analysing patient inputs to common migraine triggers such as dietary changes, sleeping habits and duration, self-perceived stress levels and consumption of prescribed medications

Significance of information	To drive clinical management; software provides information to predict the risk of developing migraine
State of Healthcare situation or condition	Non-serious condition; migraine can be managed effectively and requires only minor therapeutic interventions
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class A	

CLASSIFICATION
Examples

Software intended for healthcare professionals to acquire and monitor physiological signals from devices to detect early signs of mild sleep apnoea

Significance of information	To drive clinical management; software provides information to predict and identify the early signs of mild sleep apnoea
State of Healthcare situation or condition	Non-serious condition; mild sleep apnoea can be managed effectively and requires only minor therapeutic interventions
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class B*	

* SaMD will be classified as Class B if intended to image, measure or monitor a physiological process to drive in clinical/patient management

CLASSIFICATION
Examples

Software intended to provide sound therapy to treat, mitigate or reduce effects of tinnitus

Significance of information	To treat; software utilizes sound therapy to reduce the effects of tinnitus
State of Healthcare situation or condition	Non-serious condition; Tinnitus is not a medically serious condition which requires only minor therapeutic interventions
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class B	

CLASSIFICATION
Examples

Software intended for lay users to analyse self-taken photographs of moles. The software analyses the photographs taken and flags out unusual or irregular moles that could indicate an increased risk of melanoma

Significance of information	To drive clinical management; the software provides information to the lay user to assist in the identification of atypical moles that could be a risk factor for melanoma
State of Healthcare situation or condition	Serious condition; intended target population is not fragile with respect to the disease or condition; intervention is normally not expected to be time critical in order to avoid death, long-term disability or other serious deterioration of health
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class B	

CLASSIFICATION
Examples

Software intended for healthcare professionals to analyse electrocardiogram data to aid in the diagnosis of heart arrhythmias

Significance of information	To drive clinical management; provides information to clinicians to aid in the diagnosis of arrhythmia
State of Healthcare situation or condition	Serious condition; do not require major therapeutic interventions. Additionally, the intervention is normally not expected to be time critical in order to avoid death, long-term disability or other serious deterioration of health
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class B	

CLASSIFICATION
Examples

Software intended for healthcare professionals to provide cognitive behaviour therapy as an adjunct to contingency management system, for patients with substance use disorder

Significance of information	To drive clinical management; intended to aid in treatment of patients with substance use disorder, used as an adjunct to standard clinical treatment
State of Healthcare situation or condition	Serious condition; do not require major therapeutic interventions. Additionally, the intervention is normally not expected to be time critical in order to avoid death, long-term disability or other serious deterioration of health
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class B	

CLASSIFICATION
Examples

Software intended for healthcare professionals to analyse a patient's skin lesion images to aid in the classification of malignant and benign lesions

Significance of information	To drive clinical management; the software provides information to the clinician to assist in the evaluation of potentially malignant lesions
State of Healthcare situation or condition	Serious condition; do not require major therapeutic interventions. Additionally, the intervention is normally not expected to be time critical in order to avoid death, long-term disability or other serious deterioration of health
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class B	

CLASSIFICATION
Examples

Software intended for healthcare professionals to collect and analyse vital sign readings to triage or risk stratify patients for risk of Major Adverse Cardiac Event (MACE) at the emergency department

Significance of information	To drive clinical management; software is used to triage, risk stratify or identify early signs of a disease or conditions
State of Healthcare situation or condition	Critical condition; timely diagnosis or treatment action is vital to avoid death, long-term disability or other serious deterioration of health of an individual patient
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class C	

CLASSIFICATION
Examples

Software intended for healthcare professionals to analyse patient eye images to diagnose for diabetic retinopathy

Significance of information	To diagnose; software is used to diagnose diabetic retinopathy
State of Healthcare situation or condition	Serious condition; do not require major therapeutic interventions. Additionally, the intervention is normally not expected to be time critical in order to avoid death, long-term disability or other serious deterioration of health
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class C	

CLINICAL DECISION SUPPORT SOFTWARE
Background

- Clinical Decision Support Software (CDSS) are standalone software (including mobile applications, cloud based and web-based software) that can perform a wide range of functions for healthcare professionals, patients and caregivers to support clinical practice, clinical and patient management

- Not all CDSS in the market are medical devices, this document serves to provide clarity in qualification of CDSS i.e. in identifying a CDSS that may be classified as a medical device and on the risk classification of CDSS medical devices based on the risk classification table presented in page 11 of this document

CLINICAL DECISION SUPPORT SOFTWARE

Intended Use

- The intended use of the CDSS, taking into account the way the product is designed and/or presented will determine whether it will be regulated as a medical device

- If the intended use meets the definition of a medical device in the First Schedule of Health Products Act (HPA), then it would be subject to regulatory controls by HSA and considered a SaMD

- CDSS intended for medical purposes such as investigation, detection, diagnosis, prevention, monitoring, treatment or management of any medical condition, disease, anatomy or physiological process; will be classified as a medical device subject to regulatory controls by HSA

CLINICAL DECISION SUPPORT SOFTWARE
Qualification (MD/ Non-MD)

The CDSS will not be regulated as a medical device if:

the intended use does not meet the definition of a medical device in the First Schedule of Health Products Act (HPA)

OR

the CDSS is intended **solely** for the display or printing of medical information* about a patient or other medical information (such as demographic information, drug labelling, clinical guidelines, studies or recommendations)

*Does not include real time patient information intended for patient monitoring or treatment decisions

CLINICAL DECISION SUPPORT SOFTWARE
Qualification (Class A)

CDSS that are medical devices will be classified as Class A medical devices if they meet **all** of the below criteria:

1) Intended to analyse medical information about a patient* or other medical information (such as demographic information, drug labelling, clinical guidelines, studies or recommendations)

2) Not intended to acquire, process**, or analyse a medical image, signal or pattern from another medical device, IVD or signal acquisition system

3) Intended only to support healthcare professionals in making decisions about prevention, diagnosis, treatment or alleviation of a disease or condition

4) Not intended to replace the clinical judgement of a healthcare professional to make a clinical diagnosis or treatment decision regarding an individual patient and the healthcare professional is able to independently review the basis for the recommendation

*Refers to patient information found in physical or electronic form such as a patient's medical history, care or treatments received, diagnoses, and medications taken

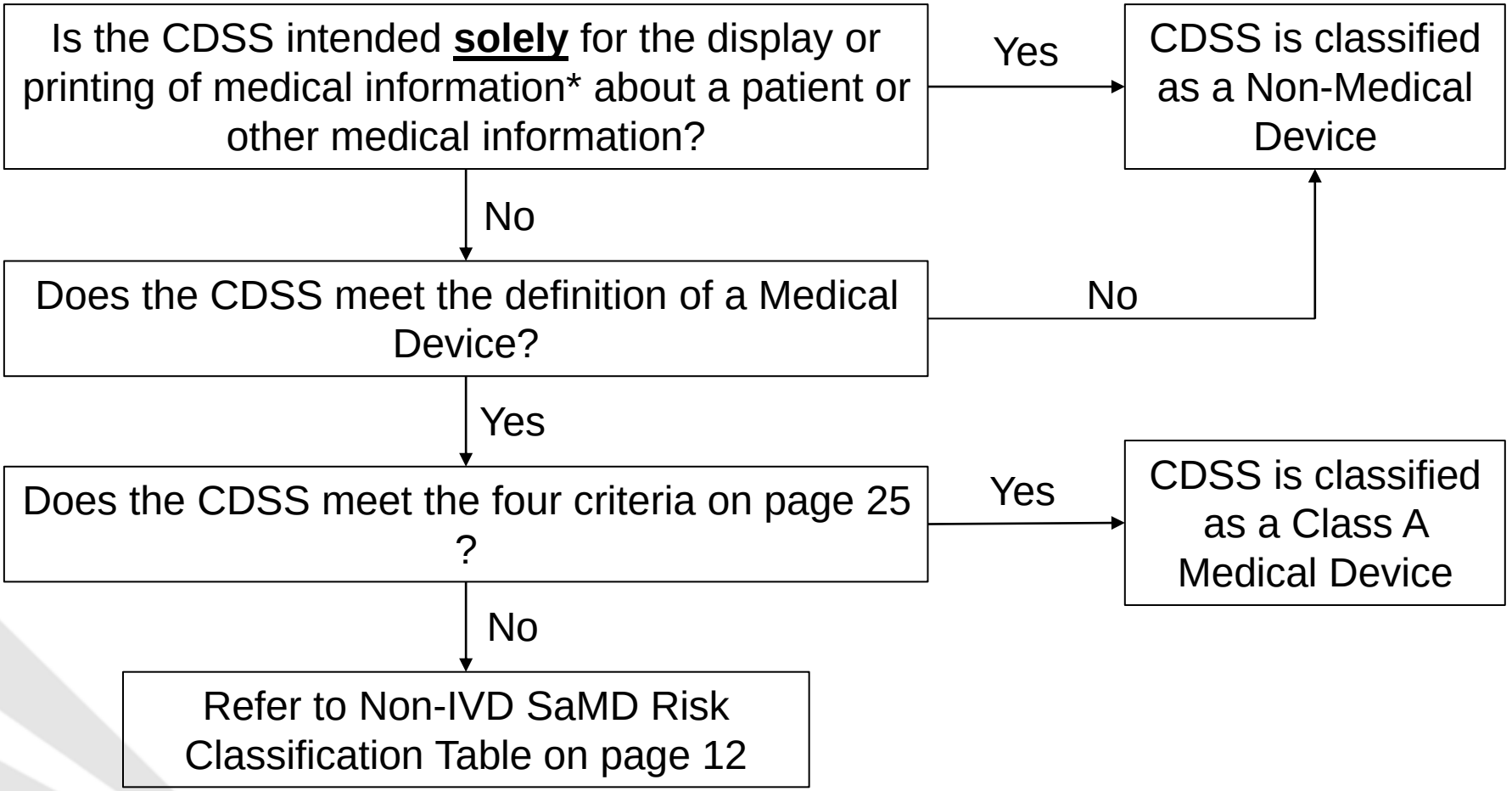
**Excludes software function solely to convert medical images or data to compatible formats (e.g. for the purposes of transfer of information)

CLINICAL DECISION SUPPORT SOFTWARE
Qualification (Class A)

Examples	Signals or patterns	Patient information or test results
DNA Sequencing	Raw data signal chromatogram	Nucleic acid sequence, variant information
Nucleic Acid Tests	Raw fluorescence or colourimetric data	Positive and negative test interpretations, cycle threshold (Ct) value, copy number
Clinical Chemistry, Immunoassays	Raw fluorescence or colourimetric data	Positive and negative test interpretations, analyte concentration (relative or semi-quantitative and quantitative)
SpO2 measurement	Light absorption signals	SpO2 reading (E.g.: 98%)

With regard to the second criterion mentioned on page 24, the table above is intended to provide better clarity on the differences between signal/patterns and patient information/test results. Generally, signals and patterns refer to parameters that require further processing before it can be interpreted.

CLINICAL DECISION SUPPORT SOFTWARE
Qualification



*Does not include real time patient information intended for patient monitoring or treatment decisions

CLINICAL DECISION SUPPORT SOFTWARE
Non-MD CDSS

Software that are solely intended for the display and printing* of medical information or do not meet the definition of a medical device are not regulated as medical devices

Such software typically do not analyse any patient specific information and do not provide any recommendations to the prevention, diagnosis, treatment or alleviation of any disease or condition

*Does not include real time patient information intended for patient monitoring or treatment decisions

CLINICAL DECISION SUPPORT SOFTWARE

Non-MD CDSS Examples

- Patient appointment and surgery schedule management software
- Software intended for patient billing purposes
- Calculator software for clinicians to perform routine simple medical calculations (Eg: BMI, Water content, Convert from mmol/L to mg/dL)
- Laboratory Information Management System (LIMS) or Laboratory Information System (LIS) to support a laboratory work flow and data tracking
- Software incorporating a digitised clinical decision flow with no analysis performed on patient information
- Software that displays information (Eg: Dosage) about drugs or medical devices that are consistent with approved labels
- Software for tracking of the end user's diet or exercise

CLINICAL DECISION SUPPORT SOFTWARE

Non-MD CDSS Examples

- Software performing a diary function (Eg: Daily recording of pain scores, bowel function)
- Electronic Health Record software intended to display, receive, collect and store patient medical records and data with no processing or analysis
- Software intended for providing medical information (Eg: Clinical guidelines) to healthcare professionals for reference, quality assurance or training purposes
- Software solely intended to allow healthcare professionals to perform teleconsultation or telecollaboration and communicate between clinicians or patients
- Survey or chat-based triaging software that refers user to seek healthcare professional advice based on user indicated symptoms
- Software solely to promote general wellness of users

CLINICAL DECISION SUPPORT SOFTWARE

Non-MD CDSS Examples

- Software that provides calendar tools for tracking of menstrual cycles
- Software that provides calendar tools to for tracking of progress through IVF treatment cycles
- Drug dosage calculator based on established clinical guidelines
- Software performing a library function to allow users to reference information based on established clinical guidelines or literature (Eg: Criteria for diagnosis of diabetes based on plasma glucose readings, clinical decision flow for treatment of patients with diabetes)

CLINICAL DECISION SUPPORT SOFTWARE
Class A CDSS

Software that meet all four criteria on page 24 may be classified as a Class A medical device

Such software typically perform the analysis on patient test results and symptoms and do not perform any analysis on images. They do not directly control the performance of therapeutic devices and the healthcare professional is able to independently verify the recommendation

CLINICAL DECISION SUPPORT SOFTWARE

Class A CDSS Examples

Software intended for healthcare professionals to analyse a patient's symptoms and test results against accepted clinical guidelines to recommend specific diagnostic tests or therapy

Criteria	Met?
Intended to analyse medical information about a patient or other medical information	Yes; software analyses the patient's symptoms and test results
Not intended to acquire, process, or analyse a medical image, signal or pattern	Yes
Intended only to support decision making about prevention, diagnosis, treatment or alleviation of a disease or condition	Yes
Not intended to replace the clinical judgement of a healthcare professional	Yes; recommendations provided by the software is based on clinical guidelines and healthcare professional is able to independently verify the recommendation

CLINICAL DECISION SUPPORT SOFTWARE

Class A CDSS Examples

Software intended for healthcare professionals to analyse a patient's test results to recommend the most appropriate surgical action and describes a surgical workflow based on accepted clinical guidelines

Criteria	Met?
Intended to analyse medical information about a patient or other medical information	Yes; software analyses the patient's test results
Not intended to acquire, process, or analyse a medical image, signal or pattern	Yes
Intended only to support decision making about prevention, diagnosis, treatment or alleviation of a disease or condition	Yes
Not intended to replace the clinical judgement of a healthcare professional	Yes; recommendations provided by the software is based on clinical guidelines and healthcare professional is able to independently verify the recommendation

CLINICAL DECISION SUPPORT SOFTWARE

Class A CDSS Examples

Software intended for healthcare professionals to analyse a patient's IVD HbA1c test result

to provide treatment recommendations for diabetes based on accepted clinical guidelines

Criteria	Met?
Intended to analyse medical information about a patient or other medical information	Yes; software analyses the patient's IVD HbA1c test result
Not intended to acquire, process, or analyse a medical image, signal or pattern	Yes
Intended only to support decision making about prevention, diagnosis, treatment or alleviation of a disease or condition	Yes
Not intended to replace the clinical judgement of a healthcare professional	Yes; recommendations provided by the software is based on clinical guidelines and healthcare professional is able to independently verify the recommendation

CLINICAL DECISION SUPPORT SOFTWARE

Class A CDSS Examples

Software intended for healthcare professionals to aid in the interpretation of variants in the genomic profiling of liquid biopsy samples based on published literature

Criteria	Met?
Intended to analyse medical information about a patient or other medical information	Yes; software analyses the patient's DNA sequence data
Not intended to acquire, process, or analyse a medical image, signal or pattern	Yes
Intended only to support decision making about prevention, diagnosis, treatment or alleviation of a disease or condition	Yes
Not intended to replace the clinical judgement of a healthcare professional	Yes; recommendations provided by the software is based on published literature and healthcare professional is able to independently verify the recommendation

CLINICAL DECISION SUPPORT SOFTWARE

Other CDSS

Software that do not meet any of the four criteria on page 24 will be classified based on the Non-IVD SaMD Risk Classification Table on page 11.

Such software may include software that analyses images or directly influence or control the performance of therapeutic devices or when the healthcare professional is unable to independently verify the recommendation made by the software driven by its built-in algorithms or artificial intelligence.

CLINICAL DECISION SUPPORT SOFTWARE

Other CDSS Examples

Software intended for healthcare professionals to acquire and analyse raw DNA sequencing signal to provide a list of drugs to avoid for patients with G6PD enzyme deficiencies based on established guidelines

Is the four criteria met?	No; software acquires and analyses a signal from an IVD, and healthcare professional is unable to independently verify the recommendation
Significance of information	To inform clinical management; information is based on existing clinical guidelines and software serves to provide clinical information by aggregating relevant information
State of Healthcare situation or condition	Non-serious condition; G6PD deficiency is a non-serious condition which can be managed effectively
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class A	

CLINICAL DECISION SUPPORT SOFTWARE

Other CDSS Examples

Software intended for healthcare professionals to analyse a patient's images to annotate anatomical features that could indicate fetal or toddler's growth or development delays based on accepted clinical guidelines

Is the four criteria met?	No; software analyses a medical image
Significance of information	To inform clinical management; information is based on existing clinical guidelines and software serves to provide clinical information by aggregating relevant information (Eg toddler's height, weight, head circumference)
State of Healthcare situation or condition	Serious condition; delay in growth may be due to underlying medical conditions (e.g. growth hormone deficiency, hypothyroidism), this may require timely interventions to mitigate any long term irreversible consequences on individual patients
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class A	

CLINICAL DECISION SUPPORT SOFTWARE

Other CDSS Examples

Software intended for healthcare professionals to analyse a patient's images to annotate anatomical features for therapy or surgical removal

Is the four criteria met?	No; software analyses a medical image, healthcare professional is unable to independently review basis for recommendation
Significance of information	To drive clinical management; the annotation of anatomical features to aid in the treatment of the patient
State of Healthcare situation or condition	Serious condition; accurate annotation of anatomical features is critical to ensure that the treatment is carried successfully to mitigate long term irreversible consequences on an individual
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class B	

CLINICAL DECISION SUPPORT SOFTWARE

Other CDSS Examples

Software intended for healthcare professionals to analyse genotyping data to provide personalised drug combinations and dosage recommendations for management of transplant patients

Is the four criteria met?	No; healthcare professional is unable to independently review basis for recommendation
Significance of information	To drive clinical management; information provided by software is used to aid in management of liver transplant patients
State of Healthcare situation or condition	Serious condition; accurate recommendation of drug combination and dosage is critical to avoid unnecessary interventions. Additionally, intervention is normally not expected to be time critical in order to avoid death, long-term disability or other serious deterioration of health
Risk Classification of SaMD as per Non-IVD SaMD Risk Classification Table: Class B	

REFERENCES

IMDRF, Software as a Medical Device (SaMD): Possible Framework for Risk Categorization and Corresponding Considerations, 18 September 2014

Health Canada, Software as a Medical Device (SaMD): Definition and Classification, 03 October 2019

TGA Australia, Clinical Decision Support Software (CDSS): Scope and examples, October 2021

US FDA, Clinical Decision Support Software (CDSS): Draft Guidance for Industry and Food and Drug Administration Staff, 27 September 2019

CONTACT INFORMATION

Medical Devices Cluster
Health Products Regulation Group
Health Sciences Authority

11 Biopolis Way, #11-03 Helios
Singapore 138667
www.hsa.gov.sg