Proposed Definition for
Clinical Decision Support Software

The International Medical Device Regulators Forum (IMDRF) has recently announced a Work Item on Standalone Software. As we understand it, in the first phase of its work, IMDRF is looking to define several important terms related to standalone software. The mHealth Regulatory Coalition -- European Union working group (MRC EU) and the CDS Coalition, whose members are listed at the end of this paper, would like to submit recommendations on the definition of Clinical Decision Support (CDS) Software.

The MRC EU and CDS Coalition represent a diverse array of stakeholders, including medical device manufacturers, smartphone healthcare application developers, cellular handset manufacturers, network operators, and back end software services and data storage providers, as well as representatives of provider organizations, clinicians, healthcare researchers, and other industry and trade associations. These organizations are located all over the world and include quite a few based in the EU and the US.

In general, we advocate a risk-based regulatory framework for standalone software. We have developed proposed policies on CDS Software, and we actively advocate with policy makers to help define an approach that protects patient safety while promoting innovation. We also engage with patient groups as well as physician and caregiver groups, to seek their input on software used by physicians or by patients and consumers in their daily lives.

MRC EU and the CDS Coalition would like to offer their recommendations on a harmonized regulatory framework that would fit into the regulatory systems in the EU, US, and other parts of the world. Wherever possible, MRC EU and the CDS Coalition would like to assist global regulators such as IMDRF to collaborate in developing a balanced regulatory framework for CDS Software.

We understand the IMDRF is now working on defining four key terms including CDS Software, and we would like to offer our thoughts on that. The MRC EU and the CDS Coalition believe that it is important to define not only which software should be considered CDS but also which CDS is regulated. The term CDS itself has a basic, existing meaning in the vernacular that may not suit well the regulatory purposes of the Forum. So we are proposing a very broad definition of CDS that coincides with its vernacular use, but also a definition of "regulated CDS" that is driven more by policies than vernacular.
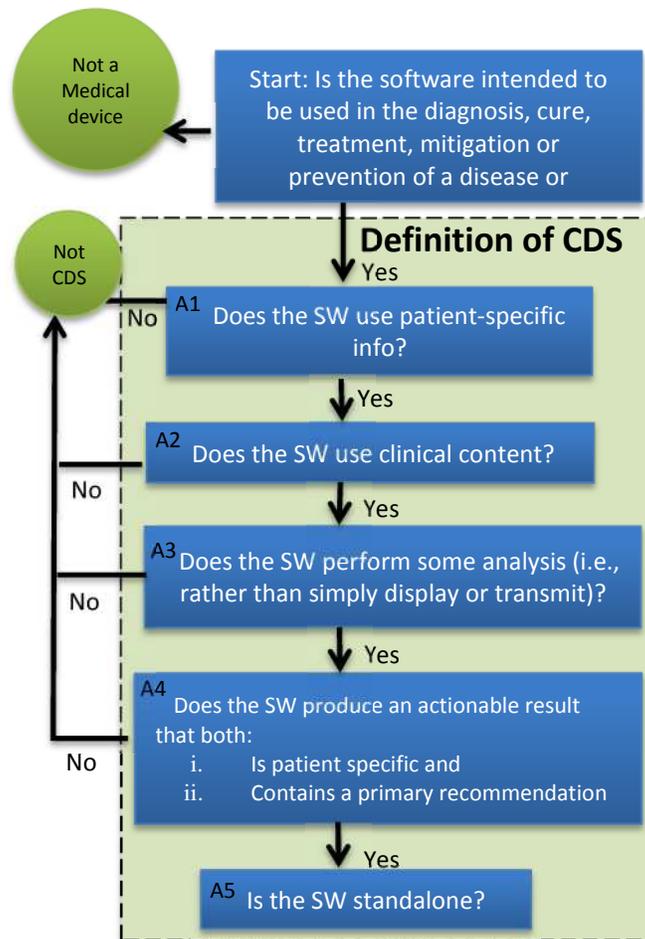
I. Definition of CDS Software

The issue of regulating CDS arose in the US formally in September, 2011 when US FDA held a hearing to discuss what ought to be regulated. After that hearing, in January 2012, a group of companies and other organizations gathered together to form the CDS Coalition to study that issue in parallel to FDA. So the information that we provide below is based on now nearly a year and a half of study.

In very broad and less formal terms, CDS is any software that allows the user to enter patient-specific information and – using formulae or other forms of analysis based on clinical information– glean from that information a patient-specific diagnosis or treatment recommendation that is used to assist in making a clinical decision.

The key elements of the CDS are:

1. The information entered into the software is specific to the patient. The information can come from many types of sources (e.g., medical devices, environmental sensors, and demographic information) and can be entered automatically or manually by the doctor or the user.
2. Software analyzes the information. The patient-specific analysis can be many types of analytic process, including: algorithms, formulae, database look-ups or comparisons.
3. Based on the patient-specific information that was entered and the analysis through a formula, or a comparison against some other reference, software makes a specific recommendation.

More formally and rigorously, we captured the different elements of CDS in the flowchart below.

The first step, which is not numbered, is a critically important one because every jurisdiction has a definition of what qualifies as a medical device. So the software must first qualify by meeting those terms, typically including an intended use for the diagnosis or treatment of a disease.

A1: Does the software use patient-specific information? This can be demographic information (age, sex), physiological (weight, body mass), symptoms, disease or condition, etc.

A2: Does the software use clinical content? Clinical content can be medical knowledge or wisdom acquired through education or experience, information available in medical literature, clinical practice guidelines, as well as generally available information regarding people's health.

A3: Does the software perform some analysis? If the software merely displays or transmits data, it is not CDS Software.

A4: Does the software produce an actionable result? In other words, is the result one that the doctor or patient can use to make a decision and take action? CDS Software does not give general descriptions of possible diagnoses or treatments, but provides a patient-specific result, and the software makes one primary recommendation.

A5: Is the software standalone? This is meant to distinguish CDS software that stands on its own from software that is incorporated into a medical device. If software is incorporated into a medical device, software acts with that device, and does not come up with a recommendation on its own.

As we explained in the introduction, this analysis typically yields what most people would refer to as CDS. We have, however, tried to frame the structure for this definition in meaningful and concrete terms that a regulatory body could use with precision. But, from a policy standpoint, it is still over inclusive because many very low risk types of software would be brought within this definition.

So, in our analysis, it's important to add a separate definition for "Regulated CDS."

II. <u>Regulated CDS</u>

CDS software is meant to support or help users make clinical or medical decisions. From a policy standpoint, in determining the difference between low risk and higher risk CDS, the question is whether the user is substantially dependent (i.e., must rely heavily) on the software to decide a diagnosis or treatment? If software does not create dependency in helping the user decide, such software should not be regulated. Conceived another way, this is the difference between on the one hand mere information that a person could get from the library or other source, and on the other hand a medical device that directly plays a role in diagnosis or treatment. Dependence on the software is the difference.

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So our proposed definition of "regulated CDS" is "CDS" that causes the user to be substantially dependent.

MRC EU and the CDS Coalition have developed proposed guidelines to determine whether the user is substantially dependent on the software. These guidelines focus on 4 criteria. If CDS Software meets these 4 criteria, the user is not substantially dependent on the software and therefore the software should not be regulated.

1. The software is transparent. This refers to how easy it is for the user to understand the basis for the software recommendation. Does the software in a meaningful way reveal the underlying data it considered, the source of its clinical analysis, and the context and clinical logic of its recommendation?
2. The user is competent to make the clinical decision. Is the user qualified - through training or professional experience - to understand and critically evaluate the software recommendations?
3. The user has time to reflect. Does the user have enough time to reflect and/or challenge the software recommendation?
4. The user has other significant clinical information to consider in making the decision.

Transparency		Competent Human Intervention		Time to Reflect		No other relevant clinical information		Not Substantially Dependent
	+		+		+		=	

So if those four conditions exist, the user is not substantially dependent on the software and the software is not acting as a medical device and should not be regulated. Thus the software would be excluded from the definition of "Regulated CDS" as it is more akin to a library function.

Below we give a little bit more description and context for these four factors.

1. Transparency of CDS Software

Transparency requires clarity with regard to four types of information.

a. The intended use

Software should explain its role in the decision making process, situations where software should not be used, who should use it - doctor, nurse, consumer, etc. - and where it should be used – hospital, home, etc.

b. Information that is entered into the software

Either manually or automatically, the user enters information about the patient into the software. The software must also contain clinical information of some sort, for example clinical guidelines or algorithms based on clinical knowledge. The software must reveal to the user at least in

general terms the information, both patient specific and more generally clinical, on which its recommendation is based.

c. Recommendation

The software should reveal its full recommendation regarding what the diagnosis or treatment should be. Sometimes the patient specific inputs or clinical knowledge do not lead to a single recommendation with much certainty, so the software has to be able to communicate the limits of its recommendations.

d. The rationale

The software should explain how it reached its recommendation. What's important is the clinical thought process, not the mechanics of the software. In this way, the software ought to roughly mimic how colleagues would consult with each other, offering the clinical rationale for their conclusions not just the conclusions.

2. Competent Human Intervention

Competent human intervention means the intended user (healthcare professional or consumer) is competent to use the software. More specifically, it means that the intended user is competent to make the underlying clinical decision. If the end-user is fully trained and experienced in the type of decision that needs to be made, the software acts merely as a convenient aid to synthesize the relevant information. Thus there can be CDS that supports decisions made by consumers as well as CDS that supports the decisions of expert physicians. The key is making sure that the intended user is well-qualified to make the decision.

3. Time to Reflect

Adequate time to reflect means the CDS software is intended to be used in a setting that allows the user sufficient time to evaluate and consider the CDS recommendation before making the particular decision. To determine whether adequate time for reflection exists, we need to consider two different factors.

The first is the amount of time available in the anticipated care setting, with the anticipated clinical condition. Treatment of a gunshot wound in an emergency department obviously allows less time to reflect than a visit with a patient with diabetes in the doctor's office.

The other factor is the complexity of the decision to be made. The clinical decision can be simple, moderate or complex. This complexity depends on how many elements the user must consider in order to make the decision.

So in determining overall the adequacy of the time for reflection, we must consider the complexity of the decision in light of the anticipated available time. An "adequate" amount of time means that the anticipated time for reflection is indeed sufficient, given the complexity of

the decision, for the competent human described above to make a confident decision with the aid of the software, but allowing needed time for appropriate challenge to the software.

4. **Other relevant clinical information**

When assessing a user's potential dependence on CDS software, the manufacturer can take into account the likelihood that the user will have direct access to other material sources of clinical information, if any, concerning the individual patient needed to make the decision. Access to enough information about the patient outside of the CDS software negates substantial dependency, assuming the other criteria listed above are met.

In cases where the software inputs include all the relevant information concerning the individual patient, this simply means the same as the inputs portion of the transparency criterion above-- the user has access to all of the information concerning the individual patient that has been inputted into the software available for direct review.

In cases where the software considers a narrower set of inputs concerning the individual patient that by themselves are incomplete for the purposes of the decision to be made, this means the decision maker has access to additional information concerning the patient helpful to the decision. For example, it may mean the patient is available to the physician for direct physical examination, or that the physician is likely to have direct access to additional, useful diagnostic information such as radiological images or laboratory test results.

The bottom line is that the manufacturer can take into account, when assessing possible dependence of the user on the software, whether the user is likely to have available to her enough information outside of the CDS recommendation concerning the individual patient to independently arrive at the particular decision.

Members of the mHealth Regulatory Coalition -- European Union Working Group and the CDS Coalition supporting this paper include:

- Aetna
- American Physical Therapy Association
- American Psychosomatic Society
- Anakena Solutions
- AT&T
- Anson Group
- CareFusion Corp.
- CDS Consortium
- Coalition for 21st Century Medicine
- Continua Health Alliance
- FujiFilm Medical Systems
- Happtique, Inc.
- Intermountain Healthcare
- Isabel Healthcare Inc.
- MedApps, Inc.

- Medtronic, Inc.
- Physician Software Systems
- Roche Diagnostics
- Vasoptic Medical
- Verizon
- Voxiva, Inc.
- WellDoc Inc.
- Wireless Life Sciences Alliance