

Metrics Champion Consortium ECG Performance Metrics: How Will We Benefit?

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- Review 25 MCC ECG Performance Metrics
- How to provide feedback to the MCC
- Q&A

MCC ECG Performance Metrics

(beta version)

Metric	Title	Metric	Title
1	% ECGs reported within agreed turnaround time	14	Average % of variance maintained in budget
2	% On-time equipment shipments to sites	15	% ECGs received from one study that were interpretable by the core lab
3	% of queries from vendor to site	16	% Manual adjustments of automatic QT annotations from one study
4	Turnaround time on resolution of site queries	Metrics 17-25: FDA ECG Warehouse	
5	% of on-time, accepted file transfers	17	Global low frequency noise content
6	Key personnel turnover during protocol	18	Global high frequency noise content
7	% of alerts successfully communicated to sites within turnaround time	19	Low frequency noise content around T-offset annotations
8	Average days from specifications signature ready to receive ECGs	20	High frequency noise content around T-offset annotations
9	% Audit findings closed within timelines	21	T-wave signal strength for beats with T-offset annotations
10	% Sites who conduct test transmission prior to FPV	22	Signal-to-noise ratio of T-wave signal to high frequency noise content around T-offset annotations
11	Average turnaround time on replacing faulty equipment	23	% ECGs without annotations
12	% of equipment failure	24	% ECGs without annotations on expected number of QTs in primary lead
13	Average days from study award to contract signature	25	% ECGs with annotations in multiple leads

Metric #1: % ECGs reported within agreed turnaround time

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: Percentage of ECGs that have met the agreed upon turnaround time from ECG receipt to successful notification of the results to the site. The TAT is defined and agreed upon between the sponsor and core lab and may be different for every protocol.</p> <p>Additional analysis on a "for cause" basis: A listing of ECGs that did not meet the expected turnaround time and the rationale for missing this target, broken out by protocol and/or site.</p>	<p>Formula: (Total N of ECGs that met the expected turnaround time / Total N of ECGs received) x 100</p> <p>Specific Example: 990 ECGs that met the expected turnaround time (10 did not); 1000 ECGs received.</p> <p>Result: 990/1000 x 100 = 99% of the ECGs met the expected turnaround time.</p>	<p>Total N and Percentage (%)</p>	<p>Monthly</p>	<p>>95%</p>
<p>General Benefit Statement</p>	<p>You will be informed of the core lab's overall ability to meet the expected turnaround times for the reporting of ECGs. In addition you will be informed as to the manner in which the core lab is able to effectively receive and report ECGs back to the sites for your studies. This information will allow you to identify issues related to ECG reporting and proactively address sponsor, core lab and site issues via training, etc. as a reduction in ECG reporting time ensures testing is completed and results provided in a timely fashion.</p>			
<p>Benefit Statement Details for Metric</p>	<p>Specifically, you can evaluate with the "for cause" report:</p> <ul style="list-style-type: none"> o ECG turnaround times for a protocol o ECG turnaround times for a site o Reasons for the ECGs not meeting the turnaround time o Site training opportunities o Protocol design considerations o Core lab capacity considerations o Site capacity considerations o Sponsor procedural considerations 			

Metric #2: % On-time equipment shipments to sites

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The percentage of sites who received their ECG equipment by the agreed upon receipt date based on defined expectations between the sponsor and core lab.</p> <p>NOTE: Timelines must be discussed, established proactively and agreed to by both parties to make this a meaningful metric.</p> <p>Additional analysis on a "for cause" basis: A listing of protocols, countries and sites that did not meet the ECG equipment receipt date based upon the defined expectations between sponsor and core lab.</p>	<p>Formula: (Total N of protocols with first equipment shipped date met / Total N of protocols with first equipment required) x 100</p> <p>Specific Example: 1000 sites initiated; 990 received machines as expected (10 did not).</p> <p>Result: 990/1000 x 100 = 99% received machines within expectations.</p>	<p>Total N and Percentage (%)</p>	<p>Quarterly</p>	<p>>95%</p>
<p>General Benefit Statement</p>	<p>You will be informed regarding the service provider's ability to finalize the predefined database, prepare and/or ship ECG supplies and deliver what is required for the site to achieve first patient visit from a core lab's requirement perspective per your contractual agreement. In addition, you can extrapolate if the core lab can provide the required start-up supplies per the timeline; resupply will occur in the same timely manner thus a resupply metric was not defined at this time. Lastly, you can assess the sponsor's ability to provide receipt dates to the core lab which is reasonable to accommodate shipping times for countries, which includes addressing Customs/Import concerns associated with countries. This will assist the sponsors and core labs in understanding the caveats in shipping to different regions of the world.</p>			

Metric #3: % of queries from vendor to site

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The number of queries generated between the core lab and the site, compared to the number of ECGs received for a sponsor and core laboratory.</p> <p>Additional analysis on a "for cause" basis:</p> <p>a. The number of queries generated between the core laboratory and site, compared to the number of ECGs received for a site and protocol.</p> <p>b. The reasons these queries were needed by the core laboratory stratified by site and protocol.</p>	<p>Formula: (Total N of queries generated between the core laboratory and the site / Total N of ECGs received) x 100</p> <p>Specific Example: 2 queries were generated between core laboratory and the site for 100 ECGs received.</p> <p>Result: (2/100) x 100 = 2 queries generated per 100 ECGs received.</p>	<p>Total N and Percentage (%)</p>	<p>Quarterly</p>	<p><20%</p>
<p>General Benefit Statement</p>	<p>You will be informed of the core lab's overall query levels for all the ECGs they are receiving. In addition you will be informed as to the manner in which the site is able to effectively complete the required fields in the ECG equipment. This information will allow you to identify those sites that may be struggling and address the challenges proactively via training, etc. as a reduction in queries helps to ensure testing is completed/results provided in a timely fashion. This also reduce time spent by the core lab in querying missing information and sites responding to queries.</p>			
<p>Benefit Statement Details for Metric</p>	<p>Specifically, you can evaluate with the "for cause" report:</p> <ul style="list-style-type: none"> o Query rate per ECG returned for a protocol and a site o Reasons for the queries which are occurring o Site training opportunities o Protocol design considerations 			

Metric #4: Turnaround time on resolution of site queries

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: Average time required for resolution of queries from central vendor to site based on the ECGs received for a sponsor and central vendor.</p> <p>Additional analysis on a "for cause" basis: The amount of time required to resolve these queries stratified by reason for a site and protocol</p>	<p>Formula: Average time from generation of site query to site's resolution of query.</p> <p>Specific Example: 2 queries were generated between the core lab and the site with TAT of 24 hours (1 day) and 72 hours (3 days).</p> <p>Result: $24 + 72 = 96$ hours $(96/2) = 48$ hours (2 days) average time from query generation to query resolution.</p>	Turnaround time – hours	Quarterly	<24 hours
<p>General Benefit Statement</p>	<p>You will be informed of the investigator site's ability to resolve queries related to ECGs in a timely manner. Less queries and/or quicker resolution time will lead to quicker ECG reports to the site and to the sponsor</p>			
<p>Benefit Statement Details for Metric</p>	<p>Specifically, you can evaluate with the "for cause" report:</p> <ul style="list-style-type: none"> o Protocols that are generating more queries that take longer to resolve o Sites that are generating more queries that take longer to resolve o Site training opportunities o Protocol design considerations 			

Metric #5: % of on-time, accepted file transfers

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The percentage of "on time" and accepted file transfers as defined by the sponsor and core lab.</p> <p>Additional analysis on a "for cause" basis: The percentages of incremental / cumulative and final "on time" accepted file transfers as defined by the sponsor and core lab per protocol.</p>	<p>Formula: (Total N of accepted on time file transfers / Total N of file transfers) x 100</p> <p>Specific Example: Q1 had 120 file transfers; 100 accepted and on time;</p> <p>Result: (100/120) x 100 = 83% on time and accepted file transfers</p>	<p>Total N and Percentage (%)</p>	<p>Quarterly</p>	<p>>95%</p>
<p>General Benefit Statement</p>	<p>You will be informed that the core lab is providing the data according to your defined expectations to support the final protocol timeline. In addition, the "whys" behind performance challenges can be discussed and process improvements defined to assist current / future protocols.</p>			

Metric #6: Key personnel turnover during protocol

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The percentage of the project management and over reader (cardiologist, MD, technician) turnover on the core lab team which supports sponsor's protocol, overall per sponsor and core lab.</p> <p>Additional analysis on a "for cause" basis: A list of project management and over reader turnover by protocol and/or sponsor.</p>	<p>Formula: (Total N project managers/over readers who have left the sponsor team / Total N project managers/over readers who are on the sponsor team) x 100</p> <p>Specific Example: 1 Project Manager left team of 5 persons supporting the sponsor.</p> <p>Result: (1/5) x 100 = 20% turnover on sponsor team.</p>	<p>Total N and Percentage (%) for both PM and over readers</p>	<p>Annually</p>	<p>Minimal</p>
<p>General Benefit Statement</p>	<p>You will be informed of the core lab's project management and over reader staff turnover. This will allow evaluation of their ability to maintain consistent staff so that core lab/sponsor continuity and associated lessons learned can be carried forward from protocol to protocol. This evaluation could help aid in discussions with the core lab should their services be negatively impacted by personnel not meeting expectations and/or not applying standard processes and/or lessons learned.</p>			

Metric #7: % of alerts successfully communicated to sites within turnaround time

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: Percentage of alerts successfully communicated to sites within the defined turnaround.</p> <p>Additional analysis on a “for cause” basis: Percentage of alerts not successfully provided within the defined turnaround time for a site and protocol.</p> <p>Note: "Successfully" could be defined per Standard Operating Procedure or specific requests per sponsor.</p>	<p>Formula: (Total N alerts which were successfully communicated / Total alerts) x 100</p> <p>Specific Example: 100 alerts successfully communicated; 120 total alerts.</p> <p>Result: 100/120 = 83% successfully communicated alerts</p>	Total N and Percentage (%)	Quarterly	>95%
General Benefit Statement	You will be informed regarding the core lab's delivery of alerts to the sites so you can evaluate and ensure that patient care is being maintained. In addition, timely, successful communication of alerts to the sites promotes site confidence in core lab and sponsor.			

Metric #8: Average days from specifications signature ready to receive ECGs

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The average number of days required to move from final signed technical specifications document (TSD) to "database ready" status as agreed upon by sponsor and core lab.</p> <p>Additional analysis on a "for cause" basis: The actual number of days required to move from final TSD (scope of work) to a "database ready" status as agreed upon by sponsor and core lab and stratified by protocol. The study type (phase of study and countries involved) should be understood by the core lab and the sponsor. The 'for cause' analysis should also contain a breakdown of the length of time the core lab had to provide these services (i.e. the time between being awarded the study and the first patient visit) and the reasons for delays to allow for a good approximation of the prioritization the core lab used in setting up the study. This breakdown should include the number (and name) of protocols awarded with <2 months lead time, 2-3 months lead time, and >3 months lead time.</p> <p>Note: Definition of "database ready" could include ability to ship equipment, perform ECG analysis, etc.</p>	<p>Formula: Total N days required to move from final TSD (or scope of work) to "database ready" / Total N of protocols evaluated.</p> <p>Specific Example: Protocol 1 = 20 days; Protocol 2 = 30 days; Protocol 3 = 33 days.</p> <p>Result: Total days = 20 + 30 + 33 = 83; (83/3) = 27.7 average days to move from final TSD (or scope of work) to "database ready"</p>	<p>Average number of days</p>	<p>Quarterly/ Annually</p>	<p>Per Contract</p>
<p>General Benefit Statement</p>	<p>You will be informed regarding the core lab's timely, effective development and completion of the database based on the contractual timelines. Additionally, this metric will provide examples of what delays are occurring at the sponsor and core lab which may help to reduce the amount of time spent in getting protocols ready for implementation. This will allow you to appropriately support the delivery of the first patient visit per the protocol timelines.</p>			

Metric #9: % Audit findings closed within timelines

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The percentage of the audit findings (including Financial, Quality Assurance and Computer Systems Quality) closed prior to or by the original timeline agreed upon between the sponsor and core lab.</p> <p>Additional analysis on a “for cause” basis: The percentage of audit findings (including Financial, Quality Assurance and Computer Systems Quality) that require an adjustment to the timelines by the number of times (e.g. one time, two times, three times, etc.) and the rationale for these changes.</p>	<p>Formula: (Total N audit findings closed per original timeline / Total N audit findings) x 100.</p> <p>Specific Example: 10 audit findings due on March 31; 1 was not closed per timeline.</p> <p>Result: (1/10) x 100 = 10% audit findings were not closed per original timeline</p>	<p>Total N and Percentage (%)</p>	<p>Quarterly</p>	<p>Minimum: >95%</p> <p>For Cause: <5% for one timeline extension</p>
<p>General Benefit Statement</p>	<p>You will be informed regarding the core lab's success in resolving audit findings. Thus, as a customer, you will be in a better position to understand core lab risk and proactively manage these risks. The for cause analysis will also allow you to understand what has impacted the timelines and better adjust for future timelines.</p>			

Metric #10: % Sites who conduct test transmission prior to FPV

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The percentage of sites who have conducted a successful, quality test transmission prior to the first subject visit.</p> <p>Additional analysis on a "for cause" basis: A listing of sites within each protocol that did not collect and transmit a successful, quality test ECG prior to having the first subject's ECG collected for a study.</p>	<p>Formula: (Total N of sites in all protocols which did transmit a successful, quality test ECG prior to the first subject's ECG / Total N of sites in all protocols) x 100</p> <p>Specific Example: 100 sites initiated; 98 conducted a successful, quality test ECG transmission prior to the first subject's ECG being collected (2 did not).</p> <p>Result: $98/100 \times 100 = 98\%$ conducted a test transmission prior to collecting the first subject's ECG.</p>	Total N and Percentage (%)	Monthly	>95%
<p>General Benefit Statement</p>	<p>You will be informed regarding the site's ability/desire to comply with sponsor's and core lab's request to practice ECG collection by transmitting a successful, quality test ECG to the core lab prior to collecting the first subject's ECG. In addition you will be informed as to the number of sites who may be having trouble with successfully transmitting a quality test ECG. This information will allow you to identify those sites that are not complying with the sponsor's/core lab's requirement that quality test ECGs be transmitted to the core lab to ensure proper working status and equipment set-up has been completed. This also allows proactive training and rationale for test transmissions to be conducted.</p> <p>NOTE: This should be a requirement for all sites. However, when sites conduct a test ECG it only shows that someone at the site has the ability to collect and transmit a successful ECG. It does not mean that everyone at the site can collect and transmit an ECG and it does not mean the site will never have issues in performing this task. However, it does show that at least one person can successfully collect and transmit ECGs, the equipment is in proper working order and the site has the facilities that will allow for successful transmission.</p>			

Metric #11: Average turnaround time on replacing faulty equipment

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The average turnaround time on replacing “faulty” equipment at the sites.</p> <p>Additional analysis on a “for cause” basis: A listing of sites stratified by protocol which had equipment issues where machines were deemed faulty by the site and needed to be replaced, including the actual time (in days) it took to have a new piece of equipment on site. The for cause analysis should also contain information on whether the equipment was deemed faulty by the core lab upon inspection of returned equipment as well as the reason it was faulty.</p> <p><i>NOTE: Not all equipment that is deemed by the site to be faulty is truly faulty. Therefore, the base metric may be misleading without the for cause analysis.</i></p>	<p>Formula: Total N days that were required to replace equipment at each site /Total N of sites that needed replacement equipment to be provided.</p> <p>Specific Example: Site 1 = 2 days; site 2 = 3 days; site 3 = 1 day.</p> <p>Result: Total days = 2 + 3 + 1 = 6; (6/3) = 2 average days to provide a site with faulty equipment a new machine.</p>	Total N of “faulty” equipment and average number of days to replace “faulty” equipment	Quarterly	<2 days
<p>General Benefit Statement</p>	<p>You will be informed regarding how often equipment is deemed “faulty” by investigative sites as well as the core lab’s ability to replace “faulty” ECG equipment in a timely manner to allow for little/no impact to subject visits. With the “for cause” analysis you will be able to see the breakdown of how long it takes to disseminate equipment to different regions of the world as well as determine how well the maintenance of the equipment is picking up potential problems with equipment before it is shipped to the sites. Additionally, you will be able to see how often sites report equipment as faulty and if it truly is faulty upon inspections. Lastly, you will be able to assess the frequency of equipment failure of various makes, models and age of ECG equipment.</p>			

Metric #12: % of equipment failure

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The percentage of ECG machines in the field that have a service failure.</p> <p>Additional analysis on a "for cause" basis: A listing of protocols, sites and type of machine that has had a service failure since the last report. This report should also detail the service failure that was encountered in each instance.</p>	<p>Formula: Total N machines at investigative sites with service failures / Total N of machines at investigative sites</p> <p>Specific Example: Two pieces of equipment in the field have had service issues out of 330 total machines in the field.</p> <p>Result: $(2/330) \times 100 = .6\%$ of the machines in the field have had service issues.</p>	Percentage (%)	Quarterly	<2%
<p>General Benefit Statement</p>	<p>You will be informed regarding the core lab's supply of ECG equipment's stability and frequency for having technical issues. With the "for cause" analysis you will be able to see the breakdown of the types of equipment with their reliability rate as well as potentially see trends in the failure rate of equipment based on the amount of time it has been at the investigative sites. Knowing this information may allow the sponsor, vendor and investigative sites to mitigate some of the service failures by knowing what to do proactively to address the problems with the ECG equipment. Additionally, you will be able to assess the frequency of equipment failure by make, model and age of ECG equipment.</p>			

Metric #13: Average days from study award to contract signature

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The average number of days required to move from study award (award e-mail/letter) to a fully executed contract.</p> <p>Additional analysis on a “for cause” basis: This is to include analysis of the reasons for delays in the process and would include, but not exclusively the following:</p> <ul style="list-style-type: none"> • Legal review of both Sponsor and Core Lab • SOW development times, based upon final protocol • Sponsor delays in study initiation • Etc. 	<p>Formula: Sum of all number of N days that were required to move from award notification to contract signature / Total N of protocols evaluated.</p> <p>Specific Example: Protocol 1 = 10 days; Protocol 2 = 20 days; Protocol 3 = 30 days. Result: Total days = 10 + 20 + 30 = 60; (60/3) = 20.0 average days to move from notification of award to contract signature</p> <p>Formula: Total number of days delayed by specific process stage.</p>	<p>Average number of days per targets of contract Days delayed</p>	<p>Quarterly</p>	<p>Per Contract</p>
<p>General Benefit Statement</p>	<p>Identifying and reducing delays in the contracting process with beneficial to both Sponsors and suppliers as a delayed contract frequently results in the delays to the study process such as:</p> <ul style="list-style-type: none"> –Study start-up activities –Payment –Invoicing 			

Metric #14: Average % of variance maintained in budget

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: Report variance in budget in terms of looking for variances between current contracted value (inc. C.O) vs. actuals at completion of budget</p> <p>Additional Analysis: Report variance in budget in terms of looking for variances between current contracted value vs. actuals at completion of a study throughout life of a project and proactively reconcile, reforecast and adjust budget to align with revised forecast for project</p>	<p>Formula: % variation between actuals vs. current contract upon completion of study.</p> <p>Formula: Earned Value Approach. Track agreed Contract Value (Total of All Contracts and Amendments or Out-of-Scope items Agreed Upon to Date) and Earned Value of Contract (Actuals Invoiced Monthly) on an ongoing basis (monthly). Reassess Total Contract Value (Quarterly) with per study look at actuals + current forecast. Re-forecast and Readjust contract value as needed. Measure variance between your current Contract Value and re-forecasted Contract Value in terms of under or over spend. Suggest quarterly reconciliation & reforecast for all trials >12 months. For studies under 12 months reconciliation & reforecast at 6 month mark.</p> <p>Specific Example: Measure deviation/variance quarter to quarter and than at the end another comparison of final contract budget vs. actuals. Standard Deviation/Variance (Range from 0-.5%) - Optimal, Deviation range .05% -1% - Satisfactory etc. Need to discuss further.</p>	<p>Average Percentage (%) of Variance maintained in budget</p>	<p>Per sponsor request</p>	<p>1) final variance between Current Contract Value and Actual Budget is > XX% Maintain >XX% average variance over course of trial</p>
<p>General Benefit Statement</p>	<p>Sponsor and supplier will play a proactive role in managing initial forecast budget. This means tracking actuals against forecasted contract budget and "reforecasting" as needed based on usage and/or study events e.g., increase in screen, adjusted enrollment NOT simply adding to budget when there is a change in scope. By reconciling and reforecasting revenue, Suppliers will be able to more accurately project revenue and sponsors will be able to readjust budgets and reallocate spend if current contract budget is "over-estimated" or proactively increase budget during the study vs. at the end. This requires support from Supplier's Finance and Project Management groups to track, evaluate, reconcile and than reforecast based on study information. Requires support from Sponsor to help with reforecast based on study factors such as enrollment rates etc.</p>			

Metric #15: % ECGs received from one study that were interpretable by the core lab

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs from one study that have not met the core lab's criteria for being impossible to interpret. The criteria will depend on the IDM protocol (less noise/baseline wander likely to be encountered with global median vs. more with 3 beats on raw signal), ECG equipment used (must know the filter settings and use them in standardized manner) and the study protocol (standardized experimental conditions with quiet supine rest on carefully executed thorough QT trials vs. less control on multicentric patient trials).</p>	<p>Formula: (Total N of ECGs identified as possible to interpret / Total N of ECGs analyzed) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 9950 were possible to interpret</p> <p>Result: 9950/10000 x 100 = 99.5% of ECGs were interpretable by the core lab.</p>	<p>Proportion (%)</p>	<p>Once during the study</p>	<p>>99.5% ECGs were interpretable by core lab</p>
<p>General Benefit Statement</p>	<p>Core labs and Sponsors will use this metric to assess the overall quality of ECG signal acquired at the study site, which may reflect the adherence of the site with the study protocol and may have an impact on the precision of IDM. This information generated <u>from one specific study</u> will allow Sponsors to identify issues related to ECG acquisition and address them on subsequent studies through selection of ECG equipment, focused on-site training and targeted monitoring of ECG acquisition during the study conduct. In addition, this information will enable the core lab to prevent measuring ECG interval duration on inadequate tracings and/or to highlight the IDMs made on tracings of suboptimal quality.</p>			

Metric #16: % Manual Adjustments of Automatic QT Annotations from One Study

(semi-automatic ‘computer-assisted’ method with visual inspection and manual adjustment whenever necessary)

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of automatic QT annotations that have been manually adjusted by the reader at the core lab</p>	<p>Formula: (Total N of manual adjustments of QT annotations by the reader / Total N of automatic QT annotations analyzed on one study) x 100</p> <p>Specific Example: 10,000 annotations visually inspected, 1000 manually adjusted</p> <p>Result: $1000/10000 \times 100 = 10\%$ of automated annotations were manually adjusted.</p>	<p>Proportion (%) of automated annotations that were manually adjusted by the reader at the core lab</p>	<p>Once during the study</p>	<p>No target applicable But low % readout should be put in the context of other results (inter-reader QA, intra-reader QA for diagnoses)</p>

- Metrics agreed upon and built by the vendor and the FDA
 - Metrics not derived from MCC input
- Free of charge to FDA during NDA review
 - Sponsors must purchase the ability to utilize metrics from the vendor
 - Metrics not provided free of charge to members of the MCC
- Metrics not automatically available for change
 - Vendor is open to MCC input into new releases

ECG Signal Quality Metrics from the FDA ECG Warehouse



Metric #17: Global low frequency noise content [FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that have the low frequency noise score above the designated threshold (to be agreed upon with the Sponsor). The criteria will depend on the IDM protocol (less noise with global median vs. more with 3 beats on raw signal) and the study protocol (standardized experimental conditions with quiet supine rest on carefully executed thorough QT trials vs. less control on multicentric patient trials).</p>	<p>Formula: $(\text{Total N of ECGs with the score for the low frequency noise above the threshold} / \text{Total N of ECGs analyzed on one study}) \times 100$</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found with the noise score above the threshold</p> <p>Result: $9950/10000 \times 100 = 99.5\%$ of ECGs with the noise score below the threshold.</p>	<p>Proportion (%) above the designated score</p>	<p>Once after the study</p>	<p>TBD - XX% ECGs with the low frequency noise score below the threshold or the global score of at least XX</p>
<p>General Benefit Statement</p>	<p>Sponsors and the FDA reviewers will use this metric to assess the overall quality of ECG signal acquired at the study site, which may reflect the adherence of the site to the study protocol and may have an impact on the precision of IDM by the core lab. This information will allow Sponsors to identify issues related to ECG acquisition and address them on subsequent studies through selection of ECG equipment, focused on-site training and targeted monitoring of ECG acquisition during the study conduct. If the analysis is performed before the study results are reported, the Sponsors could identify the poor quality ECG which might have confounded the IDM by the core lab. In addition, this information will enable the FDA to identify the IDMs made on tracings of suboptimal quality during the NDA review.</p>			

Metric #18: Global high frequency noise content [FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that have the high frequency noise score above the designated threshold (to be agreed upon with the Sponsor). The criteria will depend on the IDM protocol (less noise with global median vs. more with 3 beats on raw signal), ECG equipment used (high frequency noise dependent on the ECG device manufacturer's settings) and the study protocol (standardized experimental conditions with quiet supine rest on carefully executed thorough QT trials vs. less control on multicentric patient trials).</p>	<p>Formula: (Total N of ECGs with the score for the high frequency noise above the threshold / Total N of ECGs analyzed on one study) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found with the noise score above the threshold</p> <p>Result: 9950/10000 x 100 = 99.5% of ECGs with the noise score below the threshold.</p>	<p>Proportion (%) above the designated score</p>	<p>Once after the study</p>	<p>TBD - XX% ECGs with the high frequency noise score below the threshold or the global score of at least XX</p>
<p>General Benefit Statement</p>	<p>Sponsors and the FDA reviewers will use this metric to assess the overall quality of ECG signal acquired at the study site, which may reflect the adherence of the site to the study protocol and may have an impact on the precision of IDM by the core lab. This information will allow Sponsors to identify issues related to ECG acquisition and address them on subsequent studies through selection of ECG equipment, focused on-site training and targeted monitoring of ECG acquisition during the study conduct. If the analysis is performed before the study results are reported, the Sponsors could identify the poor quality ECG which might have confounded the IDM by the core lab. In addition, this information will enable the FDA to identify the IDMs made on tracings of suboptimal quality during the NDA review.</p>			

Metric #19: Low frequency noise content around T-offset annotations [FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that have the low frequency noise content around the T-offset annotation above the designated threshold.</p>	<p>Formula: (Total N of ECGs with the score for the low frequency noise content around T-offset annotations above the threshold / Total N of ECGs analyzed on one study) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found with the noise content score above the threshold</p> <p>Result: 50/10000 x 100 =.5% of ECGs with the low frequency noise content above the threshold.</p>	<p>Proportion (%) above the designated score</p>	<p>Once</p>	<p>TBD - XX% ECGs with the low frequency noise content below the threshold</p>
<p>General Benefit Statement</p>	<p>Sponsors and the FDA reviewers will use this metric to assess the overall quality of ECG annotation by the core lab that may have an impact on the precision of IDM. If the analysis is performed before the study results are reported, this information will allow Sponsors to evaluate the quality of core lab performance. In addition, this information will enable the FDA to identify the IDMs made on tracings of suboptimal quality during the NDA review.</p>			

FDA ECG Warehouse Metrics Indicating Compliance With QT Annotation Protocol by the Core Lab



Metric #20: High frequency noise content around T-offset annotations [FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that have the high frequency noise content around the T-offset annotation above the designated threshold.</p>	<p>Formula: (Total N of ECGs with the score for the high frequency noise content around T-offset annotations above the threshold / Total N of ECGs analyzed on one study) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found with the noise score above the threshold</p> <p>Result: $50/10000 \times 100 = .5\%$ of ECGs with the high frequency noise content above the threshold.</p>	<p>Proportion (%) above the designated score</p>	<p>Once</p>	<p>TBD - XX% ECGs with the high frequency noise content below the threshold</p>
<p>General Benefit Statement</p>	<p>Sponsors [and the FDA reviewers] will use this metric to assess the overall quality of ECG annotation by the core lab that may have an impact on the precision of IDM. If the analysis is performed before the study results are reported, this information will allow Sponsors to evaluate the quality of core lab performance. In addition, this information will enable the FDA to identify the IDMs made on tracings of suboptimal quality during the NDA review.</p>			

Metric #21: T-wave signal strength for beats with T-offset annotations [FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that have the T-wave signal strength for beats with T-offset annotations below the designated threshold.</p>	<p>Formula: (Total N of ECGs with the T-wave signal strength for beats with T-offset annotations below the threshold / Total N of ECGs analyzed on one study) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found with the T-wave signal below the threshold</p> <p>Result: $50/10000 \times 100 = .5\%$ of ECGs with the noise score below the threshold.</p>	Proportion (%) below the threshold	Once	TBD - XX% ECGs with the T-wave signal strength below the threshold
General Benefit Statement	Sponsors and the FDA reviewers will use this metric to assess the overall quality of ECG annotation by the core lab that may have an impact on the precision of IDM. If the analysis is performed before the study results are reported, this information will allow Sponsors to evaluate the quality of core lab performance. In addition, this information will enable the FDA to identify the IDMs made on tracings of suboptimal quality during the NDA review.			

Metric #22: Signal-to-noise ratio of T-wave signal to high frequency noise content around T-offset annotations

[FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that have the signal-to-noise ratio of T-wave signal to high frequency noise content around T-offset annotations below the designated threshold.</p>	<p>Formula: (Total N of ECGs with the signal-to-noise ratio of T-wave signal to high frequency noise content around T-offset annotations below the threshold / Total N of ECGs analyzed on one study) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found with the signal-to-noise ratio of T-wave signal to high frequency noise content below the threshold</p> <p>Result: 50/10000 x 100 =.5% of ECGs with the noise score below the threshold.</p>	<p>Proportion (%) below the threshold</p>	<p>Once</p>	<p>TBD - XX% ECGs with the signal-to-noise ratio of T-wave signal to high frequency noise content below the threshold</p>

Metric # 23:% ECGs without annotations [FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that have no annotations of PR, QRS, RR and QT intervals</p>	<p>Formula: (Total N of ECGs without annotations of all ECG intervals / Total N of ECGs analyzed on one study) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found without annotations</p> <p>Result: $50/10000 \times 100 = .5\%$ of ECGs without the annotations.</p>	<p>Proportion (%) without annotations</p>	<p>Once</p>	<p>All ECGs (100%) have all ECG interval annotations</p>
<p>General Benefit Statement</p>	<p>Sponsors and the FDA reviewers will use this metric to assess the overall quality of ECG annotation by the core lab that may have an impact on the outcome of the statistical analysis of ECG data. If the analysis is performed before the study results are reported, this information will allow Sponsors to evaluate the quality of core lab performance. In addition, this information will enable the FDA to identify the ECGs that have no annotations and compare them with the results reported in the NDA.</p>			

Metric #24: % ECGs without annotations on expected number of QTs in primary lead [FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that do not have annotations on the required number of beats in one lead (usually 3 beats)</p>	<p>Formula: (Total N of ECGs without annotations on the required number of beats / Total N of ECGs analyzed on one study) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found without annotations on all beats</p> <p>Result: $50/10000 \times 100 = .5\%$ of ECGs without the annotations on all beats.</p>	<p>Proportion (%) without annotations on all beats</p>	<p>Once</p>	<p>All ECGs (100%) have annotations on the required numbers of beats</p>
<p>General Benefit Statement</p>	<p>Sponsors and the FDA reviewers will use this metric to assess the overall quality of ECG annotation by the core lab that may have an impact on the outcome of the statistical analysis of ECG data. If the analysis is performed before the study results are reported, this information will allow Sponsors to evaluate the quality of core lab performance. In addition, this information will enable the FDA to identify the ECGs that have no annotations and compare them with the results reported in the NDA.</p>			

Metric #25: % ECGs with annotations in multiple leads

[FDA ECG Warehouse]

Definition	Formula/Example	Unit of Measure	Reporting Frequency	Target
<p>Minimum: The proportion (%) of ECGs that have annotations of ECG intervals on multiple leads of the same ECG</p>	<p>Formula: (Total N of ECGs with annotations in multiple leads / Total N of ECGs analyzed on one study) x 100</p> <p>Specific Example: 10,000 ECGs analyzed, 50 found with annotations in multiple leads</p> <p>Result: $50/10000 \times 100 = .5\%$ of ECGs with annotations in multiple leads.</p>	<p>Proportion (%) of ECGs with annotations in multiple leads</p>	<p>Once</p>	<p>No ECGs (0%) have annotations in multiple leads</p>

**ECG Performance Metrics (beta version) Review Period
January 22, 2007 – April 27, 2007**

- Go to www.metricschampion.org
- Download MCC ECG Performance Metrics feedback spreadsheet
- Submit your comments on the feedback spreadsheet form to:
Linda Sullivan (lsullivan@metricschampion.org)

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The screenshot shows the MCC website homepage. At the top left is the MCC logo. Below it is a navigation bar with the text "what's new?" and a URL: "MCCBoardofDirectorsPreparetoFillCentralLaboratoryPerformanceMetricsSteeringCom". The main content area is divided into two columns. The left column is titled "membership information" and contains text about the MCC's mission and a link to "view membership benefits". The right column is titled "work group information" and contains text about workgroups and links to "CLPM Metrics 1.6 summary.pdf" and "Service Provider Survey Sponsor Survey". At the bottom of the page, there are logos for "labs" and "CGS" with the text "including" and "view workgroups".

Visit www.metricschampion.org