



Second Opinion[®]
CADe Software System - Client
Computer-Aided Detection for Intraoral Bitewing and Periapical Dental
Radiographs

CLIENT USER MANUAL & LABELING

Software Version 1.0
Document Revision 1.4



Manufacturer - Pearl Inc.

8605 Santa Monica Blvd
PMB 58456
West Hollywood, California 90069-4109
USA

Authorized Representative - AJ W Technology Consulting GmbH

Königsallee 106
40215 Düsseldorf
+49 (0) 211 3013 2232
www.ajwtech.com
email: ECRep@ajwtech.com

20 Sept 2021

The information contained in this document is the exclusive property of Pearl Inc.
All unauthorized use and/or reproduction of the contents of this document is strictly prohibited.
Copyright © 2021 by Pearl Inc., California, USA. All rights reserved



Table of Contents

1. Manual Information	2
1.1 Version	2
1.2 Purpose	2
1.3 Intended Audience	2
1.4 How to obtain a paper copy of this manual	2
1.5 Regulatory Compliance	2
2. <i>Second Opinion</i>® Device Labeling	3
2.1 Brief Device Description	3
2.2 Indications for Use	3
2.3 Contraindications	4
2.3 Prerequisites	4
2.4 Warnings	4
2.5 Adverse Effects	6
2.6 Intended Use	6
2.7 Intended User Population	6
2.8 Intended Patient Population	7
2.9 Compatible Radiological Data Sources	7
2.10 Hardware Requirements	7
3. Product Information	9
3.1 Product Contents	9
3.2 Principles of Operation	9
4. <i>Second Opinion</i>® Installation Instructions	9
4.1 System Requirements	9
4.2 Installation	9
4.3 Registration	9
4.4 Updates	10
4.5 Accessing the manual and viewing the product label	10
5. <i>Second Opinion</i>® Operating Instructions	11
5.1 Description of User How <i>Second Opinion</i> ® Operates	11
5.2 Getting Started	11
5.2.1 <i>Launch Application</i>	11
5.2.2 <i>Logging On</i>	12
5.2.3 <i>Opening Screen</i>	12
5.2.4 <i>Settings Tab</i>	12
5.2.5 <i>Navigating Patient Records</i>	13



5.2.6	Finding Specific Charts	14
5.2.7	Typical Image Display	15
5.2.8	Image Selector Filmstrip	17
5.2.9	How to Read Results	17
5.2.10	How to Use the Confidence Slider	19
5.2.11	Selective Display of Potential Pathologic & Nonpathologic Detections	19
5.2.12	How to Use Image Adjustment Controls	20
6.	Summary of <i>Second Opinion</i>® Clinical Study Outcomes	21
7.	<i>Second Opinion</i>® Troubleshooting	24
8.	Service and Maintenance	26
9.	Technical Assistance	26

Caution: Federal law restricts this device to sale by or on the order of a dentist

1. Manual Information

1.1 Version

This manual is intended for correct and safe utilization of *Second Opinion*® v1.0. The GTIN Barcode denoting the version number of the software to which this manual pertains is displayed below:



(01)00860003567920(8012)1.0

1.2 Purpose

This manual provides instructions for operation of the *Second Opinion*® Client software device in accordance with its function and intended use.

1.3 Intended Audience

This manual is intended for any person who uses, maintains, or troubleshoots the *Second Opinion*® Client software device.



1.4 How to obtain a paper copy of this manual

To receive a paper copy of this manual, please send a request to Pearl Inc. at support@hellopearl.com that includes your organization name, full address, name of the product for which you are requesting a manual and its software version. Pearl Inc. will send a printed version of the manual to you via the postal service.

1.5 Regulatory Compliance

Second Opinion[®] complies with the regulatory requirements of the following:

- EN ISO 13485:2016 entitled Medical Devices.
- Quality Management Systems Requirements for regulatory purposes, FDA 21 CFR Part 820 entitled Quality System Regulation (QSR).
- EU Medical Device Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on Medical Device (MDR)
- Medical Device Single Audit Program (MDSAP)
- Canadian Medical Devices Regulations SOR 98-282
- The Health Insurance Portability and Accountability Act (HIPAA)

2. *Second Opinion*[®] Device Labeling

2.1 Brief Device Description

Second Opinion[®] is a computer-aided detection (CADe) software device intended to assist dental healthcare professionals read intraoral radiographs. A proprietary software application, it has been designed to process intraoral radiographs and automatically locate presumptive evidence of five pathologic and five nonpathologic features which may present therein.

Second Opinion[®] consists of three components:

- In-office application or Client User Interface (“Client”)
- Application Programming Interface (“API”)
- Computer Vision Models (“CV Model”, “CV Models”)

The Client resides in the clinician’s office. The API and CV Models reside in a cloud computing platform hosted by Amazon Web Services Inc. (“AWS”), where radiograph processing takes place.



Results are displayed on a computer monitor in the clinician's office for review by a dental practitioner. The user is instructed to first evaluate each radiograph in the conventional visual manner and then re-examine the radiograph utilizing *Second Opinion*® prior to making a final diagnosis.

2.2 Indications for Use

Second Opinion® is a computer aided detection ("CADe") software device indicated for use by dental health professionals as an aid in the assessment of bitewing and periapical radiographs of permanent teeth in patients 12 years of age or older. *Second Opinion*® employs computer vision technology, developed using machine learning techniques, to detect and draw attention to regions on bitewing and periapical radiographs where one of the following nine pathologic and nonpathologic dental features may appear:

1. Caries
2. Discrepancy at the margin of an existing restoration
3. Calculus
4. Periapical radiolucency
5. Widened Periapical Ligament
6. Bone Loss
7. Crown (metal, including zirconia & non-metal)
8. Filling (metal & non-metal)
9. Root canal
10. Bridge
11. Implants

2.3 Contraindications

Not to be used with patients under the age of 12 years.

2.3 Prerequisites



To operate *Second Opinion*® safely and according to its intended purpose, the following prerequisites must be met:

- The user has read and understood the Intended Use, Warnings, and Operating Instructions included in this User Manual.



- The user has a general understanding of how to use a personal computer that is running one of the compatible operating systems listed in the Reference Information section below.
- *Second Opinion*[®] has been correctly installed according to the instructions in Section 4 of this User Manual.

2.4 Warnings



The following warnings apply to the use of all *Second Opinion*[®] software:

- CAUTION: *SECOND OPINION*[®] IS NOT INTENDED TO OFFER A DIAGNOSTIC ASSESSMENT. Further clinical investigation of any detected potential pathologic and nonpathologic features that may appear in radiographs is always required.
- *Second Opinion*[®] is to be used with visual and tactile oral examination and patient risk assessment.
- Users should regularly confirm that the computer on which the *Second Opinion*[®] Client software is operating is free of viruses or malware.
- Users should regularly confirm that the *Second Opinion*[®] Client software has been updated with the latest security patches.
- Do not use *Second Opinion*[®] software without proper training. Operator training and review of the *Second Opinion*[®] user manual is required prior to using the system.
- Users should use the Confidence Slider function to view *Second Opinion*[®] detections at all three confidence threshold settings prior to taking any *Second Opinion*[®] detections into consideration.
- The *Second Opinion*[®] system may make a detection and highlight a region where no pathologic or nonpathologic feature exists. Users must always exercise their professional



interpretative skills when reviewing the regions that have been detected by *Second Opinion*[®].

- *Second Opinion*[®] may not detect or mark all regions that are indicative of a pathology. Users must always exercise their professional interpretative skills to determine whether any pathologic and nonpathologic features warranting clinical attention are present in radiographs processed by *Second Opinion*[®].
- Effectiveness and safety have been established only for detections in bitewing and periapical radiographic image types. Any features detected and highlighted on radiographs types other than bitewing and periapical cannot be used by the clinician to assist in radiographic evaluations. As an added safety provision, prior to detection processing, *Second Opinion*[®] deploys a CV Model that classifies submitted radiographs into types: Bitewing, Periapical, and Other. If an image is categorized as Other, the *Second Opinion*[®] Client will display a message to the user indicating that the image type is not supported.
- All images submitted for *Second Opinion*[®] processing must be JPEG, RVG, DCM, TIFF, PNG, and DIC. *Second Opinion*[®] may not function properly if an image in an unsupported format is submitted.

2.5 Adverse Effects

There are no known direct risks related to the use of the device to the safety or health of the user or the patient. Patients have no direct contact with the device. Indirect inherent risks are: (a) the device may not detect pathologic or nonpathologic features that present in radiographs (false negative detections); and (b) that the device may detect pathologic or nonpathologic features that do in fact present in radiographs (false positive readings). These possibilities are clearly explained in the warnings section included in the labeling of the device. Proper operation of the device is explained in the directions for use printed in this manual. The *Second Opinion*[®] output is one of several inputs that physicians employ in their decision making; final diagnostic decisions represent physicians' assessments and judgments derived from these several inputs.



2.6 Intended Use

Second Opinion[®] is a computer aided detection ("CADe") software device indicated for use by dental health professionals as an aid in the assessment of bitewing and periapical radiographs of permanent teeth in patients 12 years of age or older. *Second Opinion*[®] employs computer vision technology, developed using machine learning techniques, to detect and draw attention to regions on bitewing and periapical radiographs where one of the following nine pathologic and nonpathologic dental features may appear:

1. Caries
2. Discrepancy at the margin of an existing restoration
3. Calculus
4. Periapical radiolucency
5. Widened Periapical Ligament
6. Bone Loss
7. Crown (metal, including zirconia & non-metal)
8. Filling (metal & non-metal)
9. Root canal
10. Bridge
11. Implants

For Prescription Use only.

Second Opinion[®]'s computer-generated detections are not diagnostically valid and may not supersede a clinician's independent radiographic assessment.

2.7 Intended User Population

The intended users of *Second Opinion*[®] are dentists in various settings including primary care (e.g., family dental practice, hospital-based dentistry and dental service organizations), dental specialists, oral maxillofacial radiologists who review radiographs across these settings.

Second Opinion[®] is intended for installation at dental clinics, dental service organization offices and dental insurance providers on off-the-shelf computer systems running Microsoft Windows 7+ or through integration of an API with third-party practice management systems and X-ray sensor software.

2.8 Intended Patient Population



The device may be used to evaluate radiographs of dental patients, aged 12 and over, with permanent teeth.

2.9 Compatible Radiological Data Sources

Second Opinion[®] can process two types of intraoral radiographs: Periapical and bitewing. These radiographs can be acquired on a wide range of dental radiograph systems from different manufacturers. The radiographs are stored on clinical office network servers using digital storage systems. The system currently supports several common image formats, including JPEG, RVG, DCM, TIFF, PNG, and DIC.

As an added safety provision, prior to detection processing, *Second Opinion*[®] deploys a CV Model that classifies submitted radiographs into types: Bitewing, Periapical, and Other. If an image is categorized as Other, the *Second Opinion*[®] Client will display a message to the user indicating that the image type is not supported.

2.10 Hardware Requirements

Computer Requirements	
<i>Processor architecture</i>	Intel
<i>Minimum processor</i>	Pentium 4
<i>Minimum internal memory</i>	2 Gigabytes
<i>Minimum disk space</i>	250MB
<i>Operating system</i>	Microsoft <ul style="list-style-type: none">• Windows 7 32- or 64-bit• Windows 8.1 Update 32- or 64-bit• Windows 10 32- or 64-bit

Second Opinion[®]'s relationship to local and networked components within the dental office and cloud is illustrated in *Figure 1*, below.



3. Product Information

3.1 Product Contents

Second Opinion® Client.

3.2 Principles of Operation

After installation, the *Second Opinion*® Client connects to the cloud-based *Second Opinion*® API. To submit exams to the device, radiographic images are first selected in the *Second Opinion*® Client. To process the radiographs, *Second Opinion*® Client needs to be connected to the internet. The *Second Opinion*® Client sends the radiographs securely over the internet to cloud servers for processing. A result report and associated detections are then immediately generated by the API. The detections can then be viewed in the *Second Opinion*® Client user interface. To perform an analysis, the *Second Opinion*® Client must be authorized with valid account login credentials (username and password), which would have been configured at sign up.

4. *Second Opinion*® Installation Instructions



Warning: Pearl recommends that installation and system changes be performed by individuals familiar with the IT systems on which the *Second Opinion*® is running.

4.1 System Requirements

To use the *Second Opinion*® device you will need the following:

- A computer running Microsoft Windows 7 or newer.
- A working internet connection.

Specific computer hardware requirements can be found in Section 2.10 of this User Manual.

4.2 Installation

Download & configuration of the *Second Opinion*® installation package occurs at <http://secondopinion.hellopearl.com>

4.3 Registration

To use *Second Opinion*®, a username and password combination is required. Successful purchase of *Second Opinion* will have resulted in account creation.



After installation, the *Second Opinion*® can be started by launching the "**Second Opinion Desktop.exe**" file in the installation folder.

The client will start up and ask for a valid username and password. Fill in the credentials in the appropriate fields then press "OK". An internet connection is required for the *Second Opinion*® Client to verify the credentials.

4.4 Updates

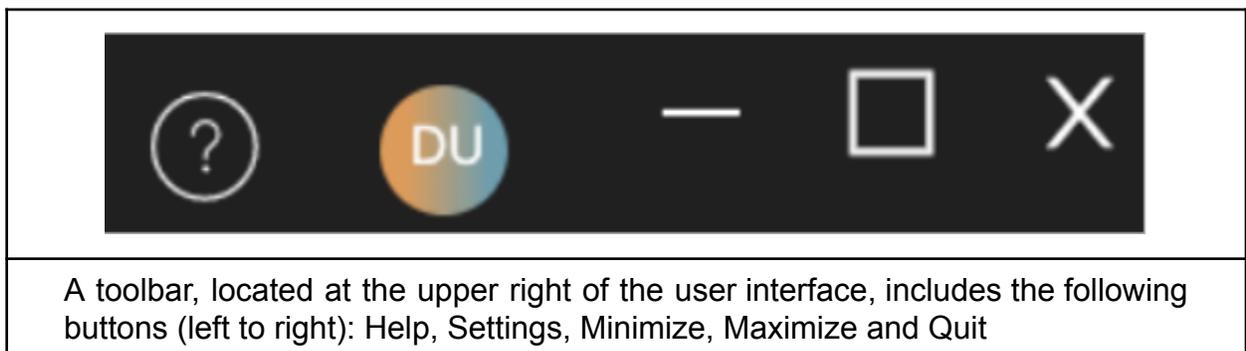
Every time the *Second Opinion*® Client starts, or every three minutes, the software checks if a software update is available. When an updated version of the software has been found, *Second Opinion*® Client will automatically download the new software and alert the user.

To install the update close and restart the application.

4.5 Accessing the manual and viewing the product label

Second Opinion® comes loaded with an up-to-date electronic copy of the user manual, which can be accessed by clicking the "Help" button in the application's toolbar, located at the upper right of the application's user. The "Help" button is denoted with a question mark icon inscribed in a circle.

Second Opinion® has an official product label that can be viewed from the "Settings" menu. The "Settings" menu can be accessed from a button, denoted with a gear icon within the application's toolbar, located at the upper right of the application's user interface.



5. *Second Opinion*® Operating Instructions



5.1 Description of User How *Second Opinion*® Operates

The *Second Opinion*® system consists of three parts: in-office application ("*Second Opinion*® Client") or User Interface ("UI"), Application Programming Interface ("API"), and Computer Vision.

The *Second Opinion*® Client is continually monitoring a local (or networked) resource where dental radiographs (refer to Section 2.4 for list of supported image types) are stored. Once new imagery is discovered, the *Second Opinion*® Client invokes cloud-based APIs which submit the imagery to Computer Vision Models ("CV Model", "CV Models") for processing. The metadata that these CV Models produce describe the nature and location of detected pathologic or nonpathologic features that may appear in the radiographs.

This metadata information is then sent back to the *Second Opinion*® Client, which renders it for visual display and review within the Client's user interface. Any potential pathologic or nonpathologic features detected will appear inscribed within color-coded boundary boxes overlaid on the original radiograph.

The entire process outlined above takes five to ten seconds to complete.

Second Opinion® CADe detects potential pathologic or nonpathologic features based on their visual appearance. Features are detected because they closely resemble known features present in the radiographs used to train the *Second Opinion*® CV Models.

The system can assist the radiologist in minimizing observational oversights by identifying regions that may warrant a more meticulous review.

The *Second Opinion*® software may be used only as an aid for detecting certain potential pathologic or nonpathologic features that can appear in bitewing and periapical radiographs. It is not for use as an aid in radiographic diagnosis or interpretation.

5.2 Getting Started

Follow the instructions below to begin using the *Second Opinion*® Client.

5.2.1 Launch Application

To launch the *Second Opinion*® Client, open the operating system's Start menu and click the All programs/All apps button to display a list of all installed applications. Click on the *Second Opinion*® application to open it.



5.2.2 Logging On

At the login window, enter Username and Password, then press Enter.

Note: For security reasons, the password is issued by the system administrator.

5.2.3 Opening Screen

When the application launches, the Home screen will display in the user interface window.

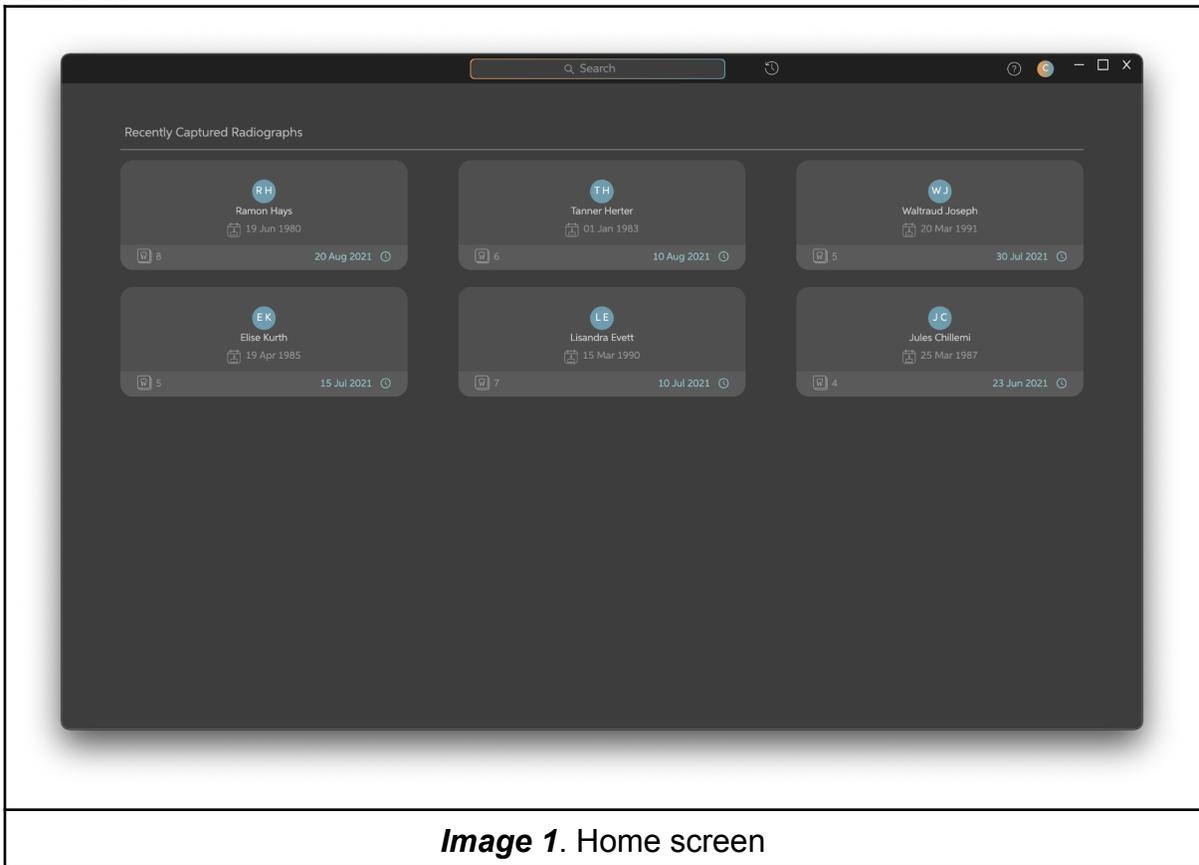


Image 1. Home screen

To search for a patient's X-rays a search bar is provided. To return to recent radiographs you may select the clock and arrow icon to the right of the search bar.

5.2.4 Settings Tab

To re-configure the Client, use the mouse to click on the "Settings" option underneath the letter icon in the application toolbar, update the file location and press save.



The language tab within settings allows for configuration of interface language and date format.

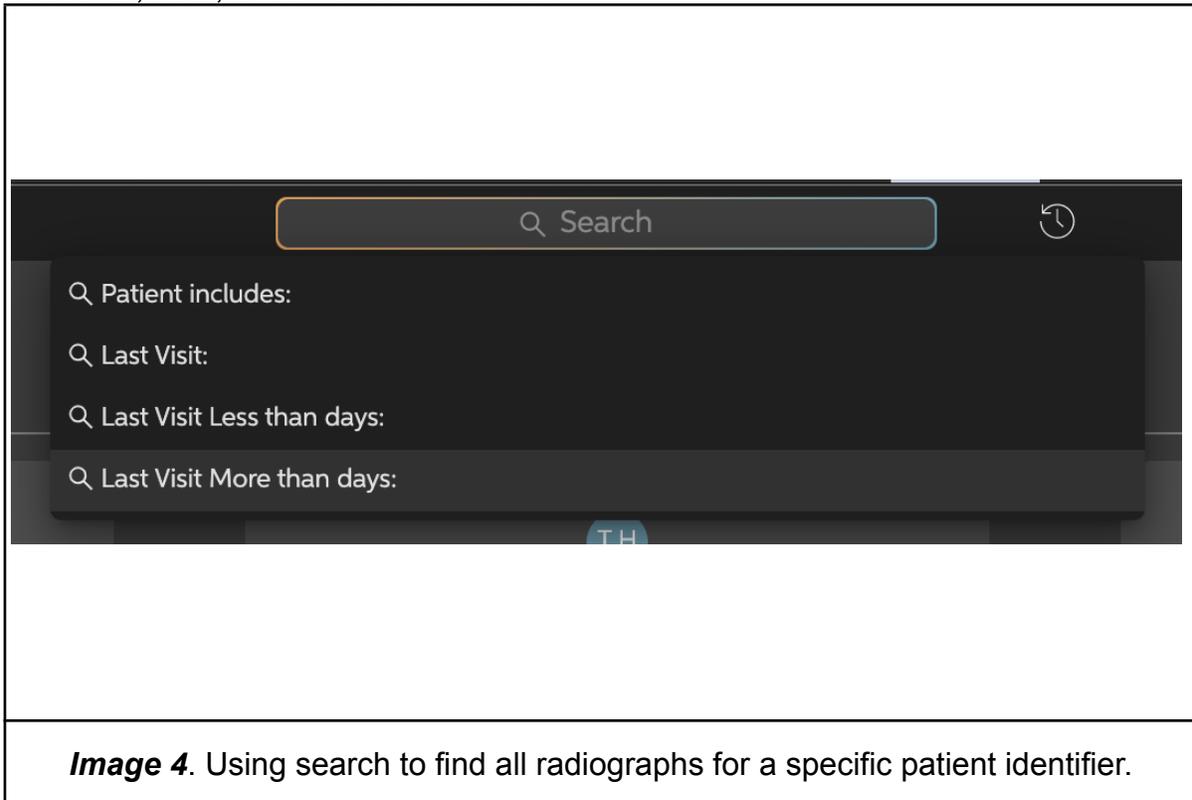
5.2.5 Navigating Patient Records

To load images from a patient visit, click on the patient record.

Charts are groups of images captured for a specific patient identifier on a specific date. The Chart List is populated in chronological order. Newly captured radiographs are accessible from the top of the list.

5.2.6 Finding Specific Charts

The search bar above the Chart List can be used to search charts by patient identifier, date, or combination thereof.



5.2.7 Typical Image Display

The Detection screen will open when a chart has been selected. The first radiograph in the chart will appear in the large radiograph display pane of the Detection screen.



Radiographs in the radiograph display pane will be scaled to fit within the pane,

To the left of the radiograph display pane is the image selector pane, displaying a thumbnail filmstrip of all radiographs contained in the chart, grouped (and collapsed) by date of radiographic capture.

To the right of the radiograph display pane, the Conditions index presents a list of all potential pathologic and nonpathologic features that *Second Opinion*[®] has detected.

Within the radiograph display pane, annotated bounding boxes are overlaid on the original radiograph to indicate regions where detected features appear. To highlight the region where a feature has been detected, the user can hover the cursor over the bounding box. Users can also highlight a region containing a detected feature by hovering the cursor over the corresponding feature in the Conditions index.



Image 5. The Radiograph Detection Display screen



Users can limit which detected features are displayed and listed using the sensitivity/specificity slider, the pathology/non-pathology toggles above the conditions index, and the checkboxes adjacent the labels. These functionalities will be further explained in sections 5.2.10 and 5.2.11 of this User Manual.

To quickly access and load a different chart, users can use the search bar, press the recent charts icon (to the right of the search bar) or press the back arrow adjacent the current chart's name to go back to prior results.

A vertical toolbar along the upper right side of the radiograph display pane includes five tools for manipulating the appearance of the radiograph in the radiograph display pane. Listed from top to bottom as they appear in the toolbar, these tools and their corresponding icons are:

- **Brightness** (☉): Adjust brightness
- **Contrast** (☒): Adjust contrast
- **Zoom** (🔍): Zoom in or out
- **Invert** (⬛): Invert colors
- **Rotate** (↻): Rotate image orientation

To access one of these tools, simply use the mouse to click on its icon using the mouse.

Section 5.2.12 of this User Manual explains these image adjustment functionalities in greater detail.

5.2.8 Image Selector Filmstrip

When a chart is loaded, all radiographs in the patient record are presented to the left of the radiograph display pane in a thumbnail filmstrip. Each date of radiographic capture serves as an expandable folder and notes the number of images contained within.

To select an image for display in the radiograph display pane, use the mouse to click on its thumbnail in the filmstrip. Users can also move between images by pressing the keyboard's up and down arrow keys.

5.2.9 How to Read Results

Second Opinion® applies bounding boxes around all potential pathologic and



nonpathologic features that it detects. These bounding boxes are color coded according to the system's confidence in a detection's accuracy. Users should understand how *Second Opinion*[®] evaluates the accuracy of a detection in order to make informed use of its detection capabilities.

The system's confidence is determined by the specificity of discernment required to make a detection. Detections that the system is most confident in are those made when a high specificity of discernment is required to flag a detection. Naturally, the system makes fewer detections when it approaches them with a high specificity requirement.

When the specificity requirement is relaxed, the system will make more detections, but it will be less confident in their accuracy. In other words, when specificity requirements are lowered, the system will be more sensitive to the presence of potential pathologic and nonpathologic features in a radiograph, at the risk of flagging features that are not present (false positive detections).

In order to offer a comprehensive list of features potentially warranting the user's attention, *Second Opinion*[®] is designed to approach the detection process with varying degrees of specificity.

The detections presented by the *Second Opinion*[®] Client are color coded to allow users to understand whether the detection is the product of a) a specificity-first detection approach, b) a sensitivity-first detection approach, or c) a detection approach that balances specificity and sensitivity.

Users should consider every *Second Opinion*[®] detection in light of the color of the bounding box inscribing it (or the color of the three dots next to the detected feature's name in the Condition index). The detection color codes are as follows:

- **Aqua Blue:** The system is highly confident in the detection's accuracy.
- **Yellow:** The system is moderately confident in the detection's accuracy.
- **Red:** The system has low confidence in the detection's accuracy.

Second Opinion[®] users should move the Confidence Slider (found at the top of the Conditions index) between the red/low, yellow/medium, and aqua/high positions to gain a fuller understanding of the qualitative character of the *Second Opinion*[®] detections prior to taking any *Second Opinion*[®] detections into consideration.



Explanation of the Confidence Slider functionality is included in Section 5.2.10 of this User Manual.

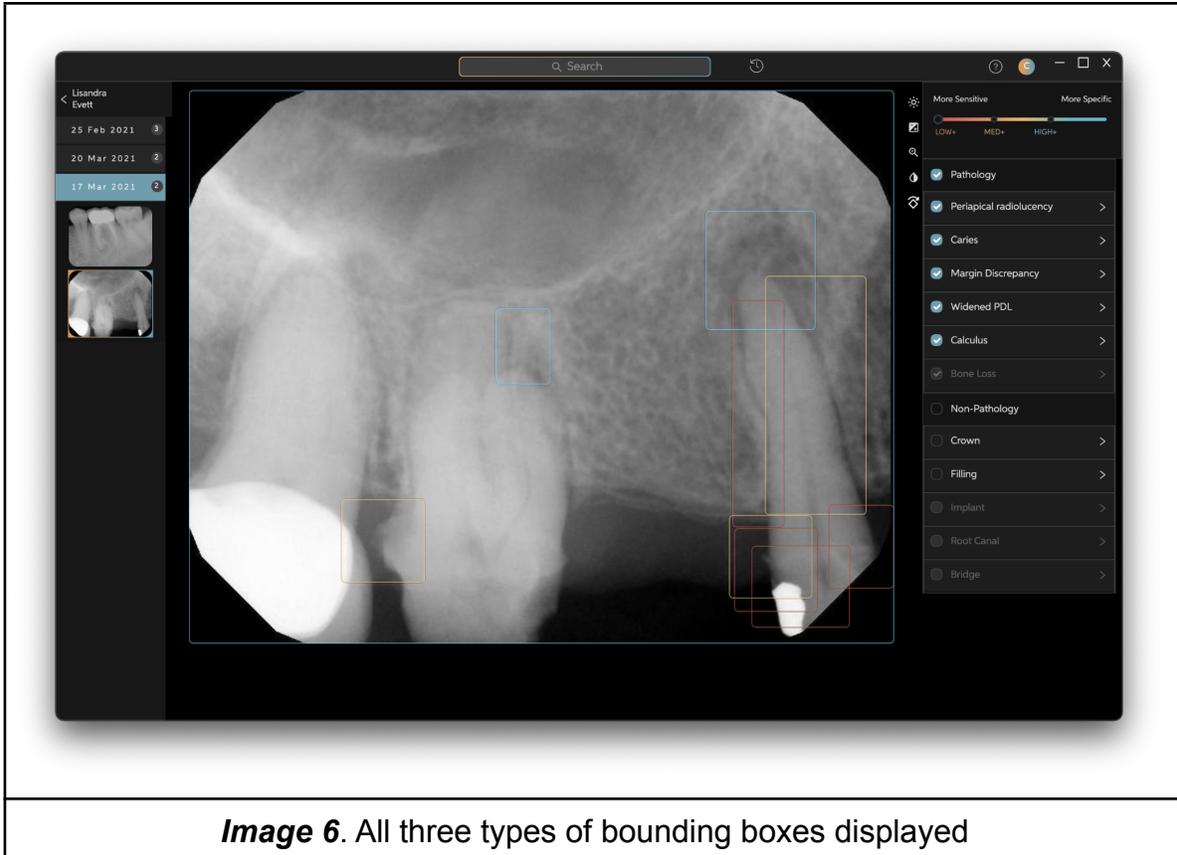


Image 6. All three types of bounding boxes displayed

5.2.10 How to Use the Confidence Slider

The Confidence Slider (found at the top of the Conditions index pane of the Detection screen) allows users to limit which detections are displayed based on the system's confidence in the detections' accuracy. By moving the slider from left to right (low to high, sensitive to specific), users can hide low and medium-confidence detections from display in both the radiograph display pane and the Conditions index. Low- and medium-confidence detections are less likely to be accurate because less specificity of discernment was required to spot them (see section 5.2.9). The slider allows users to display detections based on the following confidence thresholds:

- **High (more specific):** Only the high confidence detections will be displayed.
- **Med:** Both high and medium confidence detections will be displayed.



- **Low (more sensitive):** High, medium and low confidence detections will be displayed.

Users should view *Second Opinion*® detections at all three confidence threshold settings before taking any detections into consideration.

5.2.11 Selective Display of Potentials Detections

Located below the Confidence Slider are two toggle buttons, labeled “Pathology” and “Non-Pathology.” Users can select these toggles to show or hide detected features based on their pathologic or nonpathologic classification. When a toggle’s background is light gray, it is in the “on” state and that all detections of that class will be displayed. To display both classes of detections, ensure that both toggles are on.

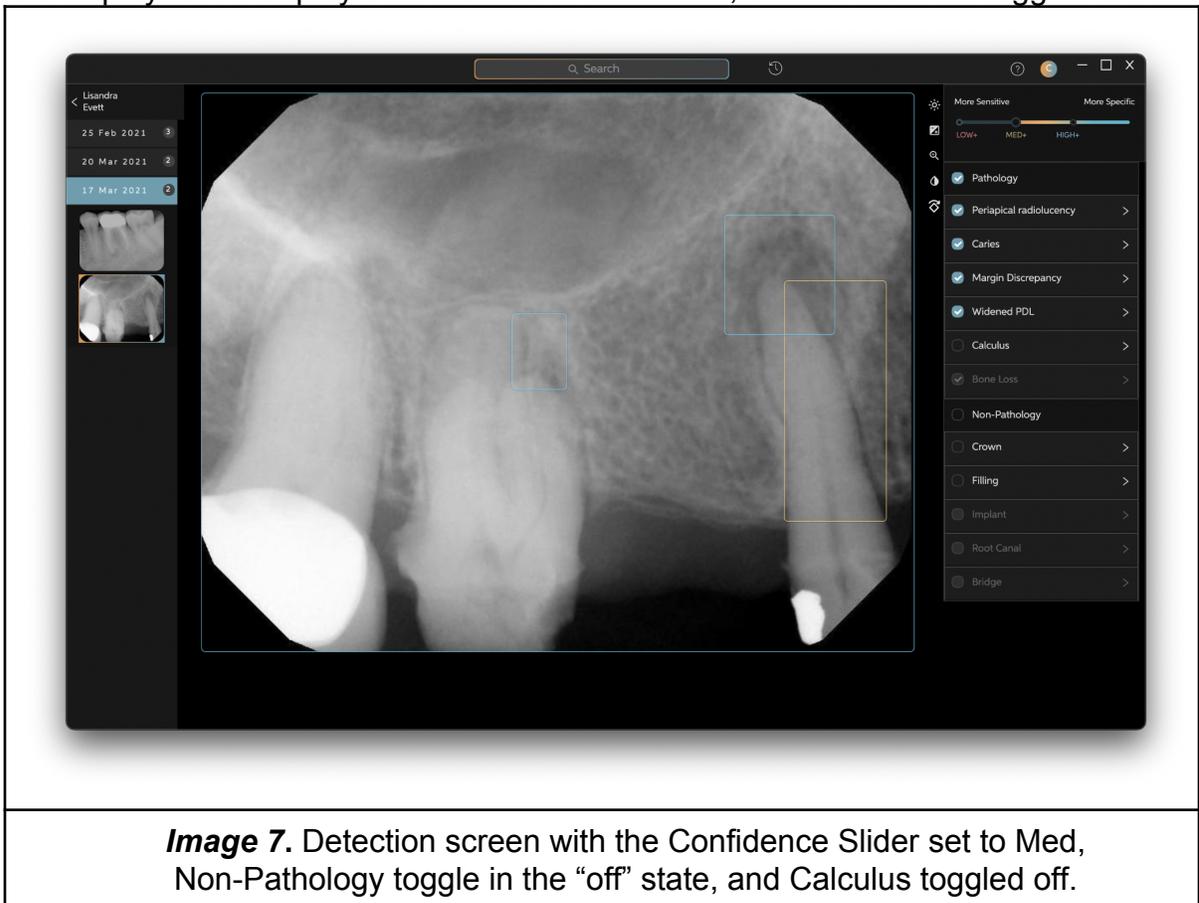


Image 7. Detection screen with the Confidence Slider set to Med, Non-Pathology toggle in the “off” state, and Calculus toggled off.

As each class of detection is grouped, when there exist results of that class there is an active checkbox. Toggling the box off will temporarily hide results of that class. If



the box is inactive then there are no results of that class to hide or show.

5.2.12 **How to Use Image Adjustment Controls**

To improve the viewability of a radiograph in the radiograph display pane, *Second Opinion*[®] offers five image adjustment tools located in a toolbar on the upper right-hand side of the radiograph display pane. These tools can be used as follows:

- **Brightness** (☼): Use this slider to adjust image brightness. Move the slider to the left to decrease image brightness. Move the slider to the right to increase image brightness. Midpoint is default (and original) brightness.
- **Contrast** (☒): Use this slider to adjust image brightness. Move the slider to the left to decrease image contrast. Move the slider to the right to increase image contrast. Midpoint is default (and original) contrast.
- **Zoom** (🔍): Use this slider to zoom in and out of the image. When the slider is the far left position, the full un-zoomed image fills the radiograph display pane; this is the default position. Moving the slider to the right will zoom in to magnify the image. When zoom is applied the image may be moved around via click and drag.
- **Invert** (⬛): Select this toggle button to invert coloration of the radiograph. Black regions of the original image will become white. White regions of the image will become black.
- **Rotate** (↻): Select this button to rotate the radiograph clockwise. Each time the button is clicked, the radiograph will rotate 90 degrees.

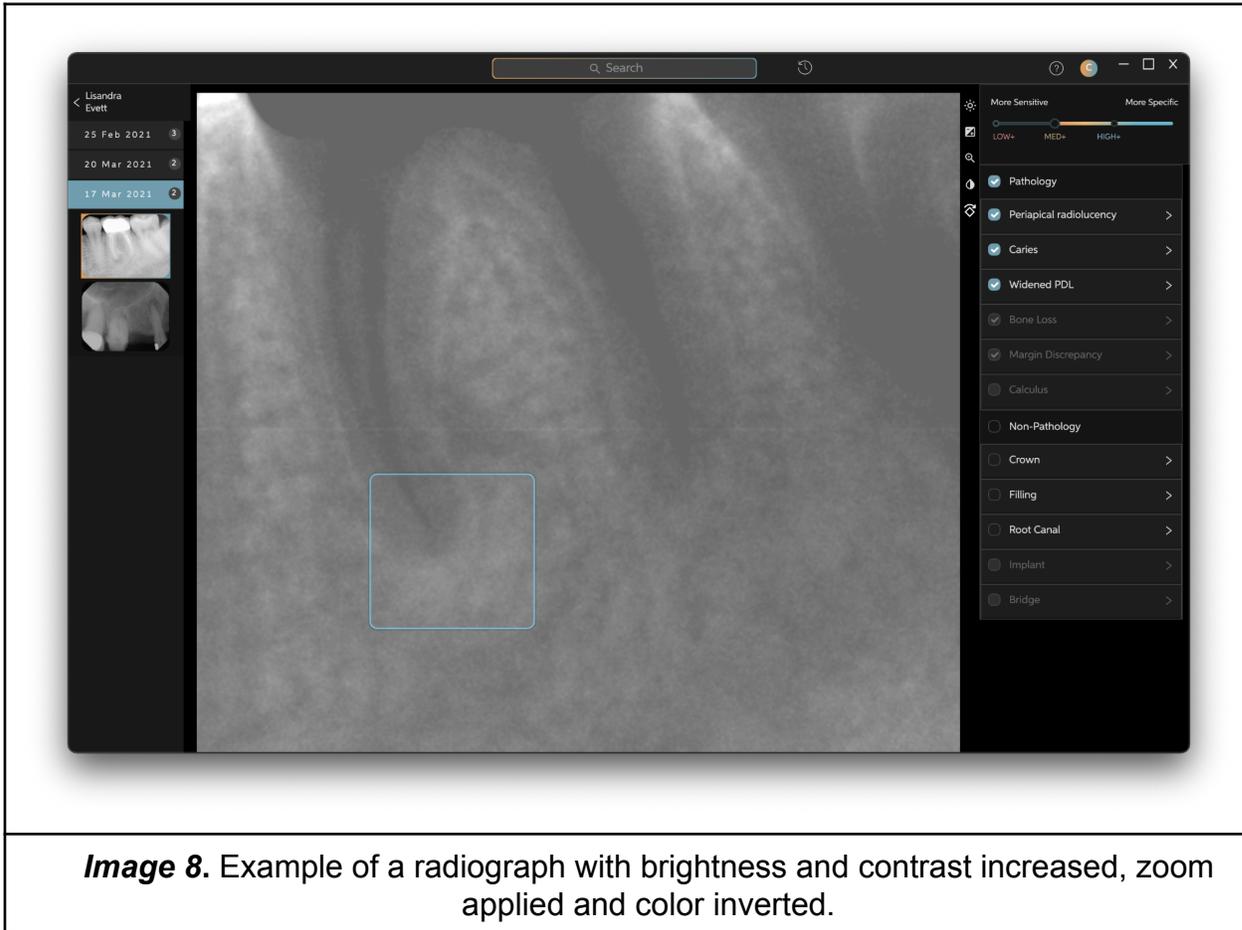


Image 8. Example of a radiograph with brightness and contrast increased, zoom applied and color inverted.

6. Summary of *Second Opinion*[®] Clinical Study Outcomes

To determine whether human readers' diagnostic accuracy improved when they used *Second Opinion*[®] to aid in their detection of certain pathologic and nonpathologic features that can appear in dental radiographs, *Second Opinion*[®] was clinically tested as a standalone device and in a fully-crossed multi-reader multi-case (MRMC) reader study. A supplemental CADE vs. Unaided Reader study was also conducted.

Both a consensus-based ground truth (GT) dataset and a forced-adjudication-based GT dataset – developed in parallel from the same geo- and pathology-enriched pool of over 2000 dental radiographs of permanent teeth – were applied in each of the three study designs. After post hoc analysis revealed higher levels of agreement among consensus GT readers than forced-adjudication GT readers, results based on consensus GT were given precedence across all studies.



The standalone studies evaluated readers' accuracy in detecting the nine dental features included in *Second Opinion*[®]'s Indications for Use, as well as one additional feature not supported by *Second Opinion*[®]:

- Caries
- Margin Discrepancies
- Calculus
- Periapical Radiolucency
- Crowns
- Bridges
- Implants
- Root Canals
- Filling
- Bone Loss
- Widened Periodontal Ligament

The MRMC studies evaluated impact on reader performance in detection of only the five pathologic features in that list. To test device performance at different user-selectable detection specificity/sensitivity settings, the MRMC studies were broken into three sub-studies with specificity/sensitivity settings locked at the low, medium, or high for each. In total, 81 qualified readers participated in the MRMC studies.

For the supplemental CADe vs. Unaided Reader studies, *Second Opinion*[®]'s diagnostic performance was compared against the accumulation of all unaided reader responses produced in the MRMC studies.

The Weighted Alternative Free-Response Receiver Operating Characteristic (wAFROC) paradigm was used as the metric of efficacy for all studies. The studies were conducted as retrospective, unblinded open-label, multi-site trials that produced clinically useful information on the potential application of this device in a dental office setting.

Second Opinion[®]'s performance met expectations in both standalone and MRMC studies. In the standalone study, the *Second Opinion*[®] CADe exhibited comparable performance to unaided readers in detecting the five pathologic features that were tested in the MRMC.

The performance of *Second Opinion*[®]-aided readers across the three slider settings collectively – reflecting the holistic effect of the device when users can freely move between slider settings as intended – demonstrated statistically significant improvement over the performance of unaided readers for caries, margin discrepancy, calculus, and



periapical radiolucency.

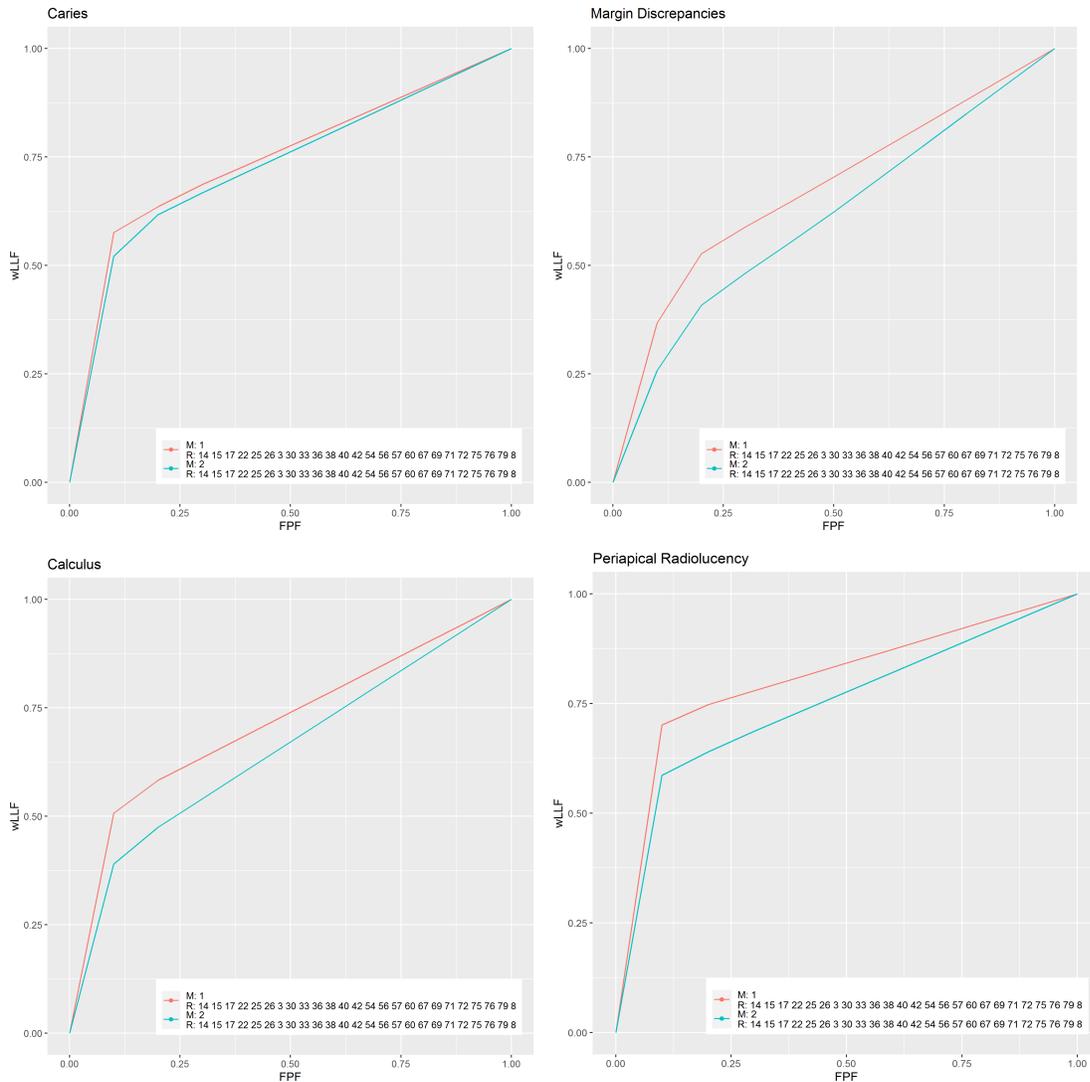


Figure 1. wAFROC-FOMs for aided readers (red) and unaided readers (teal) when using *Second Opinion*® fixed at the High setting.

No statistically significant reductions in performance were observed when readers used *Second Opinion*® as an assistive aid.

As expected, based on the intended function of the device's variable sensitivity-specificity slider settings, *Second Opinion*® improved reader sensitivity when its slider was fixed at the Low setting and improved reader specificity when its slider



was fixed at the High setting.

Analysis of study results for geographic region of image capture, patient age and patient sex confounders in the GT dataset demonstrated improvement in *Second Opinion*[®]-aided reader performance that was consistent with that observed across the studies in general. Vis-à-vis imaging device generalizability requirements, a similar concordance with overall study results was also observed in the image acquisition device subgroup, where across the five image acquisition devices with sufficient representation in the GT dataset to yield statistically meaningful results, as well as for the remaining four image acquisition devices with limited representation, aided readers outperformed unaided readers.

The statistically significant gains in aided reader performance observed in the results of these clinical studies validate *Second Opinion*[®]'s efficacy as an aid to dental health professionals in their detection of pathologic features dental of permanent teeth.

7. *Second Opinion*[®] Troubleshooting

Pearl, Inc.

Customer Support

<https://hellopearl.atlassian.net/servicedesk/customer/portal/1>

The information contained in this section provides steps that users may take to identify and solve basic problems that may occur while using the *Second Opinion*[®] Client. Any issues determined to be beyond the scope of these basic user troubleshooting instructions should be communicated to Pearl Customer Support.

A monitor, keyboard and mouse are required for troubleshooting.

Problem	Cause and Solution
Images or Results Fail to Load	<p>Ensure that the computer is connected to the local network.</p> <p>Ensure that the local network is connected to the internet.</p> <p>Ensure that the networked image drive where radiographs are stored (if utilized) is connected to the network.</p>



	<p>Quit and restart <i>Second Opinion</i>®</p> <p>If the problem persists, contact <i>Second Opinion</i>® Customer Service.</p>
Unable to Log In	<p>Verify that credentials are correct.</p> <p>Ensure that the computer is connected to the local network.</p> <p>Ensure that the local network is connected to the internet.</p> <p>Quit and restart <i>Second Opinion</i>®</p> <p>Utilize forget password link to reset password.</p>
Images Missing	<p>Ensure that the date filter in the chart search function is configured correctly.</p> <p>Ensure that the computer is connected to the local network.</p> <p>Ensure that the local network is connected to the internet.</p> <p>Ensure that the networked image drive where radiographs are stored (if utilized) is connected to the network.</p> <p>Ensure that the radiograph storage file location settings are correctly configured (see Section 5.2.4 Settings Tab for configuration instructions)</p>
Application Crashes	<p>Restart application.</p> <p>Restart the computer.</p> <p>If the problem persists, contact <i>Second Opinion</i>® Customer Service.</p>

8. Service and Maintenance



Second Opinion® is not independently user serviceable. When service is needed, Pearl will release an updated version of *Second Opinion*®. The update will be downloaded and installed automatically. See Section 4.4 of this User Manual for more information about software updates.

9. Technical Assistance

Second Opinion® Customer Service is available to answer questions about business, pricing, upgrades, customization and order status.

Technical Support is available to answer questions about technology, integration, and troubleshooting. Contact us at:

Pearl Inc.
8605 Santa Monica Blvd
PMB 58456
West Hollywood, California 90069-4109
USA

Online: <https://hellopearl.atlassian.net/servicedesk/customer/portal/1>