Selecting the Right Digital Camera for Telemedicine—Choice for 2009

Chris Patricoski, M.D., A. Stewart Ferguson, Ph.D., Jay Brudzinski, and Garret Spargo

Alaska Native Tribal Health Consortium, Anchorage, Alaska.

Abstract

Digital cameras are fundamental tools for store-and-forward telemedicine (electronic consultation). The choice of a camera may significantly impact this consultative process based on the quality of the images, the ability of users to leverage the cameras' features, and other facets of the camera design. The goal of this research was to provide a substantive framework and clearly defined process for reviewing digital cameras and to demonstrate the results obtained when employing this process to review point-and-shoot digital cameras introduced in 2009. The process included a market review, in-house evaluation of features, image reviews, functional testing, and feature prioritization. Seventy-two cameras were identified new on the market in 2009, and 10 were chosen for in-house evaluation. Four cameras scored very high for mechanical functionality and ease-of-use. The final analysis revealed three cameras that had excellent scores for both color accuracy and photographic detail and these represent excellent options for telemedicine: Canon Powershot SD970 IS, Fujifilm FinePix F200EXR, and Panasonic Lumix DMC-ZS3. Additional features of the Canon Powershot SD970 IS make it the camera of choice for our Alaska program.

Key words: *technology, evaluation, telemedicine, camera, dermatology, image*

Introduction

The digital camera is an important tool for medical image acquisition and is commonly used for store-and-forward telemedicine. Selecting a digital camera can be difficult as there are many camera models with varying capabilities, prices, and features. The decision is further complicated by a changing market with limited information on availability and expected end-of-life for each camera.

The Alaska Federal Health Care Access Network (AFHCAN) Telehealth Program relies extensively on the use of digital cameras in a statewide store-and-forward telehealth environment. Cameras are an integral component on approximately 400 telemedicine carts utilizing AFHCAN's tConsult software, representing 1 of 13 consumer devices or biomedical peripherals integrated into the tConsult software and carts.

Changing market conditions often result in the unavailability of cameras, which are then replaced by newer camera models that may (or may not) offer superior image quality and/or features. These market forces—and the need to make cameras available to our providers—force AFHCAN to conduct a formal review process every 2–5 years to select the "most appropriate" camera for telehealth needs in Alaska.[1]

In telemedicine, digital cameras have been most utilized for dermatology and there is some information on the appropriate functions and use of specific cameras for dermatologic imaging.[2–5] Practice guidelines for teledermatology include technical specifications for image acquisition, storage, retrieval, transmission, and display as well as clinical specifications.[6] The guidelines note that digital cameras are the device of choice for acquisition of still images and discuss the importance of the key components such as color bit-depth, compression, white balance, focus, and macro. The guidelines are a basis for beginning one's own search for the proper digital camera; they do not outline a selection process. There is additional information on digital camera functions and the appropriateness for other specialties. Digital cameras are used to acquire images of radiographs for telemedicine.[7,8] The digital camera is an important component of otolaryngology and there are particular features important to documentation and workflow.[9] Digital cameras have a role in home care, for example, for wound management, and there is some guidance on how to choose an appropriate camera.[10]

The goal of this review process is to identify a simple, point-and-shoot digital camera that provides high-quality images. This article

explains the evaluation and selection process leading to an appropriate digital camera choice that met our program needs for 2009.

Methods
MINIMUM REQUIREMENTS

The digital camera will be used by a variety of healthcare professionals with a wide range of camera skills, from beginner to advanced. Similarly, there will be a wide range in frequency of usage—from frequently to rarely used. For these reasons, the camera operation needs to be simple and intuitive. The AFHCAN system expects to deploy up to 400 of the selected camera—furthering the need to maintain "ease of use" but also setting a price point at or below $400 because of budget considerations.

The camera will be used mostly for primary care applications that require imaging of skin, face, eye, mouth, and extremities with pathologies such as rashes, moles, wounds, infections, orthopedic, and other traumas. There will also be other occasional uses of the camera such as photographing X-rays on a light box or documenting living conditions. Although the majority of camera use is for still images, there is an increasing role of video-clips for clinical care, for example, facial muscle movement for otolaryngology and range of motion for orthopedics.

These broad usage concepts can be distilled down to the following minimum requirements for any digital camera to be reviewed:

- Point-and-shoot (non-SLR like)
- Relatively easy to use
- Auto mode
  - Auto focus
  - Auto white balance
- Produces excellent images (in auto and macro modes)
  - Color quality
  - Image detail
- Macro mode
  - Able to photograph at 10 cm or closer to subject
- Price less than $400 (U.S. dollars)

MARKET REVIEW

A market survey was conducted by the authors to identify all point-and-shoot cameras under $400 that have macro capability and were newly available in 2009 from the major camera manufacturers including Canon, Casio, Fujifilm, HP (no longer), Kodak, Nikon, Olympus, Panasonic, Pentax, Samsung, and Sony. The review was conducted from Internet sources including websites from manufac-

turers, distributors, and camera reviewers. Only new cameras in 2009 were considered because the 2008 models (or earlier) are less likely to be available in future months/years.

A market review was then conducted with the goal of selecting the top camera from each of the participating manufacturers to include in a "hands-on" evaluation. An initial online market review (using Internet sources from manufacturers, distributors, and camera reviewers) was followed by a more thorough review relying on available literature, specification lists, other internet reviews, camera instruction manuals, and visits to local retailers.

One camera from each manufacturer was selected based on a screening process that considered positive and negative attributes. Most of these attributes have been identified over the years of working with clinicians using digital cameras in the field and reviewing new cameras. Some features were identified during the process. Specific features that favored camera selection included intuitive buttons, easy macro accessibility, macro capability closer than 10 cm, standard image storage, high definition video, and overall good reviews. Features that negatively influenced camera selection were less-durable materials, cheap-looking entry-level cameras, small size, and very small buttons. A knowledge base was developed during the market review to catalog "value-added" features of each camera. These features were either not required or not identified initially in the review process—but certainly assisted in refining the list of top candidates. Value-added features include the following:

- Auto macro capability
- Larger camera size for easy grip
- Finger position does not interfere camera operation
- Flash close to lens to avoid shadowing from lens
- Excellent compression to reduce image file size and retain detail
- Ability to easily charge the camera battery
- Ability to easily transfer images to the computer
- Ability to easily delete images
- High-quality video (also high-definition video)
- Ability to zoom during video
- Bright crisp liquid crystal display (LCD)

MEASURING "EASE OF USE" AND MECHANICAL FUNCTIONALITY

Ten "finalists" were selected from a field of 72 candidate cameras and purchased for in-house evaluation. Each of the 10 cameras was systematically reviewed by two of the authors using a Likert scale (1–5, where 1 = poor and 5 = excellent) to rate many facets of functionality and ease of use. Together, these authors have extensive use

with digital cameras, image acquisition, training, and clinical diagnosis. Facets of mechanical functionality included overall feel, accessibility of ports, accessibility of battery, accessibility of memory card, overall appearance, material, durability, button layout, and appropriate size. Ease-of-use facets included on/off, auto mode, scene mode, video mode, macro, flash, settings menus, image review, image delete, take a photo "auto," take a photo "macro," ease of macro on/off, and macro closest distance. Scores for each of the facets were averaged for mechanical functionality and ease of use.

EVALUATION—IMAGE QUALITY

Image quality was tested using a variety of human (e.g., skin) and inanimate subjects. A total of 13 subjects were used: knee, leg, face profile, back, mouth, tongue, feet, eye, dermatitis, mole, mesh, fruit, and flags. Prior to shooting images, all cameras were set to "auto" mode with other similar settings (such as image compression) that would best mimic use in a clinical environment. Images were shot with the camera in "auto" mode under identical lighting conditions. All cameras were used with a single subject before proceeding to the next subject, thereby minimizing variations in lighting and other environmental conditions. The only exception was the Kodak M1063 camera, which was not available initially.

Images from each camera were compared for color accuracy and photographic detail. The JPEG image files generated by the cameras were reviewed without any postcamera processing. All images taken by the cameras for a single subject were displayed in a tiled format on a 24" LCD monitor to allow for side-by-side comparison across cameras for each specific test subject. Images were not randomized to avoid bias related to camera favoritism. Images were evaluated together by two of the authors representing their respective clinical and technical expertise and with previous experience in image acquisition and evaluation. Together they provided one rating score for color and one for detail per image. Rating color accuracy involved comparisons against the actual subject (as needed) to determine the "real" color. For example, the hand images were compared with the real hand. Photographic detail was examined by simultaneously zooming and panning on specific edges and margins of the images. Similar focal points or edges (that were in-focus) were compared, and with zooming, the level to which the detail deteriorated and pixilated was observed. Each image was rated for color and detail on a scale of 1–4, where 1 = unacceptable, 2 = poor, 3 = good, and 4 = excellent. Color and detail scores were then averaged and equally weighed, to derive a mean that was used for ranking.

FEATURE ANALYSIS AND FINAL CAMERA SELECTION

Data from the evaluation (of mechanical functionality and ease of use) and image review (of color and detail) were used to narrow the camera selection. The top-performing cameras were further subjected

Table 1. Digital Cameras New on the Market for 2009									
CANON *POWERSHOT*	**CASIO** *EXILIM*	**FUJIFILM** *FINEPIX*	**KODAK** *EASYSHARE*	**NIKON** *COOLPIX*	**OLYMPUS** *FE, STYLUS*	**PANASONIC** *LUMIX*	**PENTAX** *OPTIO*	**SAMSUNG**	**SONY** *CYBERSHOT*
A480	EX-S5	A150	C180	L19	FE-3000	DMC-FS7	E70	HZ10W	DSC-G3
A1100 IS	EX-S12	F60fd	M1063	L20	FE-3010	DMC-FS15	P70	HZ15W	DSC-S980
A2100 IS	EX-FC100	F200EXR	M340	S220	FE-5010	DMC-FS25		SL30	DSC-T90
D10	EX-FS10	J20fd	M380	S230	550WP	DMC-FX48		SL102	DSC-T900
SD780 IS	EX-Z29	J250W	Z980	S630	7000	DMC-FX580		SL202	DSC-W220
SD880 IS	EX-Z270	Z30fd			9000	DMC-LS85		SL420	DSC-W230
SD960 IS	EX-Z400	Z33WP			6000	DMC-TS1		SL620	DSC-W290
SD970 IS	EX-H10				8000	DMC-ZS1		SL820	
SD1200 IS						DMC-ZS3		TL100	
SX200 IS								TL320	

to a "micro" analysis of features, to highlight key differences. Although some features were identified early in the selection process, other distinguishing features only become apparent after comparing notes, literature, and side-by-side testing. The distinguishing features were identified and then rated on a scale of 1–3, where 1 = fair (some issue is present), 2 = better, and 3 = best.

Results

The market survey identified 72 point-and-shoot digital cameras that entered the market in 2009 (*Table 1*). Based on the minimal requirements and value-added features, the following cameras were

selected as top candidates and were purchased for in-house testing and evaluation: Canon Powershot SD970 IS (Canon SD970), Canon Powershot A1100 IS (Canon A1100), Casio EXILIM EX-FC100 (Casio FC100), Fujifilm Finepix F200EXR (Fujifilm F200), Kodak EasyShare M1063 (Kodak M1063), Nikon Coolpix S630 (Nikon S630), Olympus Stylus 7000 (Olympus 7000), Panasonic Lumix DMC-ZS3 (Panasonic ZS3), Pentax Optio P70 (Pentax P70), and the Samsung TL320. Important specifications and features of these 10 digital cameras are presented in *Table 2*.

Four cameras received an overall score of 4 or higher on the tests for functionality and "ease of use": Canon SD970, Fujifilm F200,

Table 2. Finalists Selected for "In House" Evaluations: Important Features

CAMERA	MAX. RES. (MEGA-PIXELS)	OPTICAL ZOOM (×)	MAXIMUM APERTURE F	AUTO MACRO	CLOSEST MACRO (CM)	BATTERY	IMAGE STORE	DOCKING STATION (CRADLE)	PRICE (U.S. DOLLARS)	DIMENSIONS (MM)
Canon Powershot SD970 IS	12.1	5.0	3.2	Yes	2	Custom Li Ion	SDHC SD	No	380	95×57×26
Canon Powershot A1100 IS	12.1	4.0	2.7	Yes	3	2×AA	SDHC SD	No	200	95×62×31
Casio EXILIM EX-FC100	9.1	5.0	3.6	Yes	3	Custom Li Ion	SDHC SD	No	400	99×58×23
Fujifilm FinePix F200EXR	12.0	5.0	3.3	Yes	5 or 4	Custom Li Ion	SDHC SD xD	No	400	98×59×23
Kodak EasyShare M1063	10.3	3.0	2.8	No	10	Custom Li Ion	SDHC SD	Yes	180	91×57×21
Nikon Coolpix S630	12.0	7.0	3.5	No	2 or 7	Custom Li Ion	SDHC SD	No	280	97×58×26
Olympus Stylus-7000	12.0	7.0	3.5	Yes	2 or 8	Custom Li Ion	xD	No	300	96×56×25
Panasonic Lumix DMC-ZS3	10.1	12.0	3.3	Yes	3 or 1	Custom Li Ion	SDHC SD	No	400	103×60×33
Pentax Optio P70	12.0	4.0	2.6	No	10	Custom Li Ion	SDHC SD	No	200	97×54×22
Samsung TL320	12.0	5.0	2.8	Yes	3	Custom Li Ion	SDHC SD	Yes	380	97×60×22

Max. Res., maximum resolution.

Table 3. Evaluation of Mechanical Functionality and Ease of Use

CAMERA	FUNCTIONALITY[a]	EASE OF USE[b]	AVERAGE
Canon Powershot SD970 IS	4.17	3.96	4.065
Canon Powershot A1100 IS	3.22	3.77	3.495
Casio EXILIM EX-FC100	3.17	3.08	3.125
Fujifilm FinePix F200EXR	3.94	4.08	4.01
Kodak EasyShare M1063	3.67	3.31	3.49
Nikon Coolpix S630	4.0	4.12	4.06
Olympus Stylus-7000	3.67	4.19	3.93
Panasonic Lumix DMC-ZS3	4.28	4.62	4.45
Pentax Optio P70	3.17	3.62	3.395
Samsung TL320	4.11	3.54	3.825

Ratings are based on Likert scale of 1–5, where 1 = poor (worst), 2 = fair, 3 = good, 4 = very good, and 5 = excellent (best).

[a]Average of nine facet ratings representing mechanical functionality.

[b]Average of 13 facet ratings representing overall ease of use.

Table 4. Evaluation of Image Quality

CAMERA	COLOR	DETAIL	MEAN	RANKING
Canon Powershot SD970 IS	3.77	3.50	3.635	3
Canon Powershot A1100 IS	3.62	3.46	3.54	5
Casio EXILIM EX-FC100	3.69	3.31	3.5	6
Fujifilm FinePix F200EXR	3.92	3.54	3.73	2
Kodak EasyShare M1063	3.31	3.375	3.34	8
Nikon Coolpix S630	3.62	2.85	3.235	9
Olympus Stylus-7000	3.92	3.19	3.555	4
Panasonic Lumix DMC-ZS3	3.85	3.69	3.77	1
Pentax Optio P70	3.62	2.58	3.1	10
Samsung TL320	3.54	3.15	3.345	7

Nikon S630, and Panasonic ZS3 (*Table 3*). Informal comments from all of the authors confirmed that these four cameras offered excellent mechanical features and were relatively easy to use.

The results of the image reviews for both color accuracy and photographic detail are shown in *Table 4*. The Fujifilm F200, Olympus 7000, Panasonic ZS3, and Canon SD970 were rated the highest for color and the Panasonic ZS3, Fujifilm F200, Canon SD970, and Kodak M1063 were rated the highest for detail. Three cameras stood out as having both high-quality color and detail: Panasonic ZS3, Fujifilm F200, and Canon SD970. These three cameras also had the least number of "unacceptable" images having inadequate detail or color so that they are not useful for clinical interpretation and are represented by a score of 2.5 or less: Canon SD970 (0), Canon A1100 (2), Casio FC100 (4), Fujifilm F200 (0), Kodak M1063 (2), Nikon S630 (6), Olympus 7000 (2), Panasonic ZS3 (1), Pentax P70 (6), and Samsung TL320 (2).

The three cameras that stood out as having the best image quality were also in the group of four cameras rated highest for functionality and ease of use. This led naturally to the selection of these three cameras for "micro" analysis of features and capabilities by the authors and additional staff. The analysis revealed multiple differences between the three cameras; of these, 12 were deemed important and could have a significant impact on the AFHCAN Telehealth Program. Each feature was discussed and rated to facilitate the decision process (*Table 5*). The Canon SD970 ranks highest with respect to these distinguishing features and was eventually selected as the camera of choice.

Table 5. Distinguishing Features of the Three Best Digital Cameras

	CANON SD970[a]	FUJI F200 EXR[a]	PANASONIC ZS3[a]
Point-and-shoot macro	3	3	3
Appropriate flash	3	2	1
Image file size	3	3	2
Widest angle lens	2	3	3
Handling issues	2	1	2
Overall size	2	2	3
Battery and compartment	3	2	1
LCD screen	2	1	3
USB cord (standard)	3	2	2
Image transfer behavior	3	2	1
Video quality	3	2	3
Video zoom	1	1	3
Total	30	24	27

3 = best, 2 = good, 1 = fair; 1 indicates some issue.

[a]These three excellent cameras have many differences in terms of specifications and features. These particular distinguishing features are most important to our program and are rated on a qualitative scale.

Discussion

This study identified three new digital cameras that are excellent options for telemedicine: Canon SD970, Fujifilm F200, and Panasonic Z3. All three cameras are fairly small with retractable lens and dial and button controls; they all have full auto functions that include macro as well as image stabilization. Each camera utilizes a lithium ion battery that requires removal for charging in a plug-in battery charger. The battery of the Canon SD970, Fujifilm F200, and Panasonic ZS3 is reported to take 270, 230, and 300 shots, respectively. Shooting in the highest resolution, the Panasonic had the largest average file size (4060 KB), followed by the Canon (2968 KB) and Fujifilm (2278 KB).

The Canon SD970 offers 12.1 megapixel (MP) images, 5× optical zoom, image stabilization, auto macro as close as 2 cm, and 1280 × 720 video. The camera is small with some unique-looking buttons. It is a camera that most users will not have any difficulty with; there is little to go wrong. The camera does not flash unless absolutely needed, and there was no overexposure due to flash. Images were consistently very good to excellent. There are a few minor issues with this camera. The flash is located at the front upper left corner and the typical user may unknowingly cover it with their middle finger. Images show slight barrel distortion at the wide end of zoom. Zooming during movie capture mode may cause the image to lose focus.

The Fujifilm F200 offers 12.0 MP images, 5× optical zoom, auto macro as close as 5 cm, and 640 × 480 video. This is a modern-looking camera (slightly larger than the Canon SD970) touted for its new EXR sensor technology. The camera is simple to use in the auto mode and produces very good to excellent images. The images have the smallest file size of the three top cameras tested. One problem with this camera is the dial knob that can be accidentally turned by the user's thumb. Compared with the two other cameras, the LCD screen is not as bright and has a narrower viewing angle. The battery can drop out when opening the compartment to remove the SD memory card. The video is of lower quality when compared with the other two cameras and the zoom is disabled when capturing a movie.

The Panasonic ZS3 offers 10.1 MP images, 12× optical zoom, auto macro as close as 1 cm, and 1280 × 720 video. It has a large retractable Leica lens that can produce an amazing 12× zoom, although the clinical applications may be limited for this feature. The Panasonic is slightly larger than the Canon or Fujifilm and fits comfortably in the hand, although the user's index finger naturally extends to the dial knob instead of the shutter button. The camera is marketed as a crossover digital camera-camcorder. The video switch is easily engaged by a small red button. The videos were crisp and clear and have excellent stereo audio. The LCD screen is probably the best of compact digital cameras. However, there are some minor issues with this camera. When one turns on the camera when attached to a personal computer (PC) for image transfer, the camera goes into active mode and the lens opens and goes out, in, and then out. This could lead to a future problem. There is a flimsy latch on the battery department. The Panasonic ZS3 also produced the largest file sizes of the three top cameras.

The market research revealed several new changes in 2009 that are relevant to clinical photography. Perhaps most importantly, many cameras now offer auto macro as part of their auto mode, thereby removing the need to put the camera into macro mode when taking a

close-up of a skin lesion or other pathology. Some companies have decreased the number of camera models released; one manufacturer (Hewlett Packard) has actually discontinued manufacturing digital cameras. Few 2009 models are available with docking stations (camera cradles). Kodak and Panasonic have continued docking stations but have released fewer models; no other manufacturer has a new camera with docking station. Docking stations are useful for transferring images, for charging the camera battery, and to serve as a common location for the camera to be returned after use. This is especially important for telemedicine programs with multiple sites and users.

It should be mentioned that during this and previous review processes, it became apparent that there are many camera features that have little to do with the clinical needs of our telemedicine program. The following are commonly marketed camera features that are not important for most medical and telemedicine applications: large pixel image size, uncompressed image capture, high zoom capability, self-timer, rapid sequential photos (speed capture), small camera size, and having a view finder (for outside sunny shots).

This study follows a similar process described previously by the authors.[1] Although the process can be documented and followed in a stepwise manner, there are often details that influence the decision-making process, which are subtle, complex, or difficult to explain. Two examples in this study stand out and should be mentioned.

First, image review scores, when averaged, do not always reflect the real story. There may be a need to weigh certain image scores higher; for example, clinical image scores are probably more important than object images. Skin color is probably more important than detail, as most images provide a sufficient level of detail. Sometimes, a camera will perform poorly under one condition, which pulls down the overall score. In this study, the Panasonic ZS3 did not flash under incandescent lighting when shooting a leg image, but this one score was an outlier when compared with all other images. One needs to consider if such conditions are relevant to the clinical application at hand.

Second, the reviewers need to look for the "fail-proof factor" throughout the review process. That is, is there one aspect of the camera (functional or mechanical) which would commonly cause poor performance? A systematic evaluation may not detect these issues, and even if they are detected, the scoring strategy may not lower the score enough to remove the camera.

Examples of issues in this study included the following:
- A camera did not give obvious feedback when the image was out of focus.

- A camera's USB transfer cable port was difficult to find and risked being damaged.

A single factor would cause a camera to be disqualified, but this might be lost in the scoring/averaging process. Sometimes, a camera can score very high in the evaluation process, yet there are one or two underlying problems that should disqualify the camera. These negative attributes are often found somewhere in the evaluation process, but are not reflected in averaged scores.

This evaluation process was both qualitative and quantitative and also subject to a variety of errors and omissions. Human visualization of the images was used, because it represents real human perspective and interpretation of the images, and has served well in the past for camera selection. Other technical mechanisms of image review were not used. The value of the qualitative portion is dependent on the reviewer and may be especially sensitive to bias. Reliance on quantitative data may miss critical details and not capture the essence of the pros and cons of the product. Because of resource limitations, only 10 out of 72 new cameras were reviewed after a culling process that introduces the risk of missing an "ideal" candidate. This study also makes certain assumption about users and operating conditions—such as relying on "auto mode" for all imaging. Many cameras can be manipulated by more experienced users by using advanced features and settings to produce additional high-quality images.

Although the authors are confident in this process and the final selection, it is entirely possible that other programs or reviewers will find other "ideal" choices. This process and the resulting selections are examples of what can be done by other programs and the results will vary depending on needs and requirements.

Disclosure Statement

No competing financial interests exist.

REFERENCES

1. Patricoski C, Ferguson AS. Selecting a digital camera for telemedicine. *Telemed J E Health* 2009;15:465–475.

2. Krupinski EA, LeSueur B, Ellsworth L, Levine N, Hansen R, Silvis N. Diagnostic accuracy and image quality using a digital camera for teledermatology. *Telemed J* 1999;5:257–263.

3. Whited J, Hall R, Simel D, Foy M, Stechuchak K, Drugge R, Grichnik J, Myers S, Horner R. Reliability and accuracy of dermatologist's clinic-based and digital image consultations. *J Am Acad Dermatol* 1999;41:693–702.

4. Bhatia A, Kostuchenko P, Greenwood P. Digital cameras: Still photography and video imaging in teledermatology. In: Wooton R, Oakley A, eds. *Teledermatology.* London, England: Royal Society of Medicine Press, 2002:41–55.

5. Madden BC, Miller CC. Teledermatology camera procedures and settings (v1.06): Canon digital Rebel XT (350D).

6. Krupinski E, Burdick A, Pak H, Bocachica J, Earles L, Edison K, Goldyne M, Hirota T, Kvedar J, McKoy K, Oh D, Siegel D, Antoniotti N, Camacho I, Carnahan L, Boynton P, Bakalar R, Evans R, Kinel A, Kuzmak P, Madden BC, Peters S, Rosenthal L, Simmons S, Bernard J, Linkous J. American Telemedicine Association's Practice Guidelines for Teledermatology, 2008. Telemed E Health 2000;14:289-302.

7. Corr P, Couper I, Beningfield SJ, Mars M. A simple telemedicine system using a digital camera. *J Telemed Telecare* 2000;6:233-236.

8. Krupinski EA, Gonzales M, Gonzales C, Weinstein RS. Evaluation of a digital camera for acquiring radiographic images for telemedicine applications. *Telemed J E Health* 2000;6:297-302.

9. Smith RV. The digital camera in clinical practice. *Otolaryngol Clin North Am* 2002;35:1175-1189.

10. Dermarest L, Acoraci LR. Choosing and using a digital camera in home care. *Home Healthc Nurse* 2004;22:61-63.

Address correspondence to:
Chris Patricoski, M.D.
Alaska Native Tribal Health Consortium
4000 Ambassador Drive
Anchorage, AK 99508

E-mail: cpatricoski@afhcan.org