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Handheld X-Ray Units: What You Need to Know

Gordon's Clinical Observations: Use of handheld x-ray units has steadily increased since the Nomad *(Aribex)* was introduced in 2005. Handheld units are now used routinely by clinicians both inside and outside the dental office *(nursing homes, humanitarian service projects, homebound patients, etc.)*. Some clinicians are replacing multiple older wall-mounted units with a single handheld unit carried room to room. *CR has studied this concept and provides a state-of-the-art report for you on this unique concept.*

Handheld x-ray units are quick and easy to position and use.

Handheld x-ray units have many advantages, however they require changes in technique and changes in thinking. For example, the thought of remaining in the operatory while acquiring radiographs may seem irresponsible and hazardous to many wall-mounted x-ray users. **This article compares multiple handheld units to wall-mount units, and discusses the following:**

• Safety • Performance • Image quality • Local regulations • Advantages and limitations

Are handheld units safe to operate?

Yes, all units tested were safe *when used correctly*.

- Backscatter shields protect the operator's sensitive organs *(thyroid, gonads, etc.)* from backscatter radiation *when correctly oriented (see Handheld Safety Tips at right).*
- Leakage was minimal and well below FDA limits *(tested by trusted professional).*

Do handheld units provide quality images?

Yes, all units tested provided clinically adequate images, *comparable to images obtained with wall-mount units.*

- 86% of 136 handheld x-ray users rated image quality as ***equal to*** or ***better than*** wall-mounted units.
- ***Handheld units tolerate some movement***, because the sensor remains immobile in the patient's oral cavity.

Advantages of Handheld Units

- **Portable:** Practical for use both inside, and outside the dental office.
- **Small footprint:** Single unit can do the work of multiple wall-mount units *(potential cost/space savings).*
- **Easy to use:** Compatible with existing film, phosphor plate, or digital sensors. Slight learning curve.
- **Quick:** Freehand aiming of handheld units simplifies radiograph acquisition without leaving the room.
- **Fewer retakes:** Eliminates x-ray head drift, and patient movements can be observed and adjusted for.

Limitations of Handheld Units

- **Handle with care:** Handheld units are susceptible to being dropped and damaged. Set unit down while repositioning the sensor, rather than attempting to tuck it under an arm, handing unit to patient, etc.
  – Neck straps available for some models, but create infection control challenges.
  – Protection plans available for some models *(example Nomad Protection Plan: about $900/year).*
- **Battery life:** Handheld units ***MUST*** be recharged regularly. Batteries have a limited life span requiring eventual replacement *($145–$400).*
- **Longevity** is still being established *(wall-mount units routinely last 20 years+).*
- **Weight:** Require physical strength and proper technique to safely operate and acquire images.
- **Cost:** Purchase price is comparable with high-end wall-mount units, however recurring maintenance, calibration, and other costs can be significant.
- **Local regulations** and safety requirements vary greatly by geographic location. ***It is strongly recommended that you consult your local regulatory board to verify local safety regulations prior to purchase.***

Handheld Safety Tips

- **Educate staff members** regarding safety and proper use of handheld units.
- **Orient backscatter shield perpendicular to operator** and as close to the patient as possible.
  – ***If not perpendicular***, instruct patient to make necessary adjustments *(tilt head, hold sensor in place, etc.)* maximizing operator safety.
- **Hold unit at mid-torso height**.
- **If backscatter shield interferes with RINN style positioning arms:** purchase shorter positioning arms, or modify existing arms, rather than attempting to remove or modify backscatter shield.
- **Handle and store unit with care**. If unit is dropped and damaged, discontinue use and send in for repair.
- ***CR Note:*** *It is strongly recommended that you select an FDA approved model purchased from a reputable source.*

Correct positioning ensures operator safety; note protection zone *(green)*

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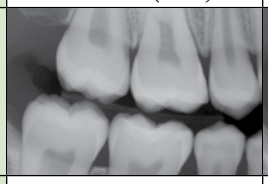
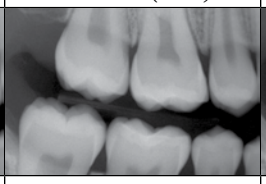
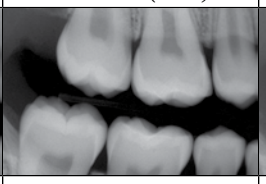
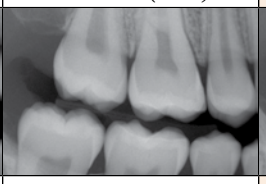
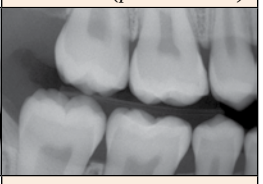
Handheld X-Ray Units: What You Need to Know *(Continued from page 1)*

Comparison of X-Ray Units

Comparison of four commercially available handheld x-ray units and one wall-mounted control.
Additional brands are available and similar models are marketed under other names.

X-Ray Unit Type	Portable Handheld				Wall Mount *(control)*
Brand	**Nomad Pro 2**	**XTG**	**MaxRay**	**MobileX**	**Preva DC**
Distributor	**KaVo Kerr**	**Digital Doc**	**Vector**	**Denterprise International**	**Progeny**
Manufacturer	Aribex	Digimed	Dexcowin	Remedi	Midmark
Photo					
Price	$8,295	$7,995	$5,500	$4,795	$5,900–$6,250 *
Tube Voltage	60 kV *(fixed)*	60 kV *(fixed)*	65 kV *(fixed)*	70 kV *(fixed)*	60, 65, or 70 kV
Tube Current	2.5 mA *(fixed)*	2.0 mA *(fixed)*	1.7 mA *(fixed)*	2.0 mA *(fixed)*	4, 5, 6, or 7 mA
Time Range *(increments)*	0.02–1.00s *(0.01s)*	0.01–1.00s *(0.01s)*	0.05–1.35s *(0.05s)*	0.01–2.00s *(0.01s)*	0.01–2.00s *(pre-set values)*
Example Bitewing Radiograph					
Exposure Time *(seconds)*	0.33	0.35	0.45	0.35	0.064
Battery Life †	700 exposures	220 exposures	250 exposures ‡	400 exposures	—
Ease of Use	Excellent–Good	Good	Good	Excellent–Good §	Good–Fair
Weight	6.0 lbs	5.3 lbs	6.0 lbs	4.7 lbs	—
Infection Control	Excellent–Good	Good–Fair	Good–Fair	Good §	Excellent–Good

** Mobile unit $8,100* *† Varies with exposure time/sensor type; values based on bitewing times listed*
‡ External battery; operable while recharging *§ Optional pistol grip trigger sensor*

Summary of Chart:

- **Price:** Ranged from $4,795–$8,295. Comparable to high-end wall-mounted units for 1–2 operatories.
- **Tube voltage *(kV)* and current *(mA):*** Most handheld units have a fixed tube voltage and current *(exposure time is the only variable)*. Wall mount units may have variable tube voltage and current, which allow greater control of exposure and contrast.
- **Radiograph quality:** All units tested were capable of producing clinically adequate images of comparable quality.
- **Weight and ease of use:** Weight ranged from 4.7 to 6.0 lbs. "Pistol grip" models were easiest to operate, regardless of weight. "Camera style" units were also easy to operate with aid of removable wrist supports and neck straps *(infection control concern)*.
- **Battery life:** *Varied significantly*; all units will likely serve *most offices* for an entire patient day between rechargings. The Nomad Pro 2 had the longest battery life, and the most convenient battery configuration *(external, user replaceable battery)*.
- **Infection control:** Of concern, due to constant repositioning of intraoral sensors while operating unit. Cloth straps and openings around buttons and plastic seams presented infection control and cleaning challenges with many units. Most manufacturers recommend cleaning with disinfectant wipes.

CR CONCLUSIONS:

- **The handheld x-ray units tested for this report were found to be:**
  - **Safe:** When used correctly, operators are protected from significant backscatter radiation and leakage.
  - **Capable of quality images:** Most users felt image quality was equal to that of wall-mount units.
  - **Quick:** Handheld units are easily maneuvered, require less running back and forth, and may enable fewer retakes.
  - **Portable:** Handheld units are ideal for use *outside* the dental office; *inside* a single unit can potentially replace multiple wall-mount units.
  - **Less resilient than wall-mount units:** The longevity of handheld units is still being established, but are: prone to damage if dropped, have limited battery life, require recharging, and often require more frequent maintenance and calibration.
- **Check local regulations prior to purchase** of handheld x-ray unit, as requirements and regulations ***vary WIDELY!***
- **All handheld x-ray units tested produced clinically useful images.** The **Nomad Pro 2 by KaVo Kerr** had the best combination of features and has an abundance of clinical use and research. Other lower cost units show promise; the longevity of these devices is still being established.