State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Solicitation

NUMBER	PAGE
MCH13049	1

ADDRESS CORRESPONDENCE TO ATTENTION OF:
ROBERTA WAGNER
304-558-0067

RFO COPY

VENDOR
Monaghan Medical Corporation
5 Latour Avenue Suite 1600
Plattsburgh, NY 12901

SHIP TO
HEALTH AND HUMAN RESOURCES
BPH - OMCFH
MATERIALS MANAGEMENT
900 BULLITT STREET
CHARLESTON, WV
25301 304-558-3417

DATE PRINTED
08/24/2012

BID OPENING DATE: 09/27/2012 BID OPENING TIME 1:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT

THE STATE OF WEST VIRGINIA AND ITS AGENCY WEST VIRGINIA DEPARTMENT OF HEALTH AND HUMAN RESOURCES, OFFICE OF MATERNAL, CHILD AND FAMILY HEALTH REQUEST A QUOTE TO PROVIDE VALVED HOLDING CHAMBERS FOR PRESSURIZED METERED DOSE INHALERS (PMDI'S) PER THE ATTACHED SPECIFICATIONS.

BID OPENING DATE: SEPTEMBER 27, 2012 AT 1:30 PM
LOCATION: PURCHASING DIVISION, BUILDING #15
2019 WASHINGTON STREET, EAST
CHARLESTON, WV 25305

RECEIVED
2012 SEP 25 AM 10:00
WV PURCHASING DIVISION

REFERENCE ATTACHED INSTRUCTIONS TO BIDDERS.

0001	6,560	EA	.	475-00-99-001	$4.75 ea=$237.50 cs/50	$31,160.00

VALVED HOLDING CHAMBER FOR PMDI'S OR EQUAL PN 79750Z Monaghan Z STAT

TO ESTABLISH A CONTRACT FOR THE ONE TIME PURCHASE OF 6,560 VALVED HOLDING CHAMBERS FOR PRESSURIZED METERED DOSE INHALERS (PMDI'S) THAT WILL BE DISTRIBUTED BY THE BUREAU FOR PUBLIC HEALTH, OFFICE OF MATERNAL, CHILD AND FAMILY HEALTH'S INFANT, CHILD AND ADOLESCENT HEALTH PROGRAM TO VARIOUS MEDICAL CARE SITES LOCATED ACROSS WEST VIRGINIA PER THE ATTACHED SPECIFICATIONS.

SIGNATURE	TELEPHONE	DATE
	800-343-9071	9/21/12
TITLE V.P Sales & Marketing	FEIN 14-1552699	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Solicitation

NUMBER	PAGE
MCH13049	2

ADDRESS CORRESPONDENCE TO ATTENTION OF:
ROBERTA WAGNER
304-558-0067

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE
Monaghan Medical Corporation
5 LaTour Avenue Suite 1600
Plattsburgh, NY 12901

SHIP TO
HEALTH AND HUMAN RESOURCES
BPH - OMCFH
MATERIALS MANAGEMENT
900 BULLITT STREET
CHARLESTON, WV
25301 304-558-3417

DATE PRINTED
08/24/2012

BID OPENING DATE: 09/27/2012 BID OPENING TIME 1:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
	****** THIS IS THE END OF RFQ MCH13049 ****** TOTAL:					$31,160.00

SIGNATURE [signature] TELEPHONE 800-343-9071 DATE 9/21/12

TITLE V.P. Sales & Marketing FEIN 14-1552699 ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO SOLICITATION, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

INSTRUCTIONS TO VENDORS SUBMITTING BIDS

1. **REVIEW DOCUMENTS THOROUGHLY:** The attached documents contain a solicitation for bids. Please read these instructions and all documents attached in their entirety. These instructions provide critical information about requirements that if overlooked could lead to disqualification of a Vendor's bid. All bids must be submitted in accordance with the provisions contained in these instructions and the Solicitation. Failure to do so may result in disqualification of Vendor's bid.

2. **MANDATORY TERMS:** The Solicitation may contain mandatory provisions identified by the use of the words "must," "will," and "shall." Failure to comply with a mandatory term in the Solicitation will result in bid disqualification.

3. **PREBID MEETING:** The item identified below shall apply to this Solicitation.

   [✓] A pre-bid meeting will not be held prior to bid opening.

   [ ] A **NON-MANDATORY PRE-BID** meeting will be held at the following place and time:

   [ ] A **MANDATORY PRE-BID** meeting will be held at the following place and time:

   All Vendors submitting a bid must attend the mandatory pre-bid meeting. Failure to attend the mandatory pre-bid meeting shall result in disqualification of the Vendor's bid. No one person attending the pre-bid meeting may represent more than one Vendor.

   An attendance sheet provided at the pre-bid meeting shall serve as the official document verifying attendance. The State will not accept any other form of proof or documentation to verify attendance. Any person attending the pre-bid meeting on behalf of a Vendor must list on the attendance sheet his or her name and the name of the Vendor he or she is representing. Additionally, the person attending the pre-bid meeting should include the Vendor's E-Mail address, phone number, and Fax number on the attendance sheet. It is the Vendor's responsibility to locate the attendance sheet and provide the required

information. Failure to complete the attendance sheet as required may result in disqualification of Vendor's bid.

All Vendors should arrive prior to the starting time for the pre-bid. Vendors who arrive after the starting time but prior to the end of the pre-bid will be permitted to sign in, but are charged with knowing all matters discussed at the pre-bid.

Questions submitted at least five business days prior to a scheduled pre-bid will be discussed at the pre-bid meeting if possible. Any discussions or answers to questions at the pre-bid meeting are preliminary in nature and are non-binding. Official and binding answers to questions will be published in a written addendum to the Solicitation prior to bid opening.

4. **VENDOR QUESTION DEADLINE:** Vendors may submit questions relating to this Solicitation to the Purchasing Division. Questions must be submitted in writing. All questions must be submitted on or before the date listed below and to the address listed below in order to be considered. A written response will be published in a Solicitation addendum if a response is possible and appropriate. Non-written discussions, conversations, or questions and answers regarding this Solicitation are preliminary in nature and are non-binding.

Question Submission Deadline: September 11, 2012

Submit Questions to:

Roberta Wagner
2019 Washington Street, East
P.O. Box 50130
Charleston, WV 25305
Fax: 304-558-3970
Email: Roberta.A.Wagner@wv.gov

5. **VERBAL COMMUNICATION:** Any verbal communication between the Vendor and any State personnel is not binding, including that made at the mandatory pre-bid conference. Only information issued in writing and added to the Solicitation by an official written addendum by the Purchasing Division is binding.

6. **BID SUBMISSION:** All bids must be signed and delivered by the Vendor to the Purchasing Division at the address listed below on or before the date and time of the bid opening. Any bid received by the Purchasing Division staff is considered to be in the possession of the Purchasing Division and will not be returned for any reason. The bid delivery address is:

Department of Administration, Purchasing Division
2019 Washington Street East
P.O. Box 50130,
Charleston, WV 25305-0130

The bid should contain the information listed below on the face of the envelope or the bid may not be considered:

SEALED BID
BUYER: Monaghan Medical Corporation
SOLICITATION NO.: MCH13049
BID OPENING DATE: 9-27-2012
BID OPENING TIME: 1:30PM
FAX NUMBER: 518-561-5088

In the event that Vendor is responding to a request for proposal, the Vendor shall submit one original technical and one original cost proposal plus [ ] convenience copies of each to the Purchasing Division at the address shown above. Additionally, the Vendor should identify the bid type as either a technical or cost proposal on the face of each bid envelope submitted in response to a request for proposal as follows:

BID TYPE: [ ] Technical
[✓] Cost

7. **BID OPENING:** Bids submitted in response to this Solicitation will be opened at the location identified below on the date and time listed below. Delivery of a bid after the bid opening date and time will result in bid disqualification. For purposes of this Solicitation, a bid is considered delivered when time stamped by the official Purchasing Division time clock.

Bid Opening Date and Time:	September 27, 2012 at 1:30 pm
Bid Opening Location:	Department of Administration, Purchasing Division 2019 Washington Street East P.O. Box 50130, Charleston, WV 25305-0130

8. **ADDENDUM ACKNOWLEDGEMENT:** Changes or revisions to this Solicitation will be made by an official written addendum issued by the Purchasing Division. Vendor should acknowledge receipt of all addenda issued with this Solicitation by completing an Addendum Acknowledgment Form, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

9. **BID FORMATTING:** Vendor should type or electronically enter the information onto its bid to prevent errors in the evaluation. Failure to type or electronically enter the information may result in bid disqualification.

GENERAL TERMS AND CONDITIONS:

1. **CONTRACTUAL AGREEMENT:** Issuance of a Purchase Order signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid signifies Vendor's agreement to be bound by and accept the terms and conditions contained in this Contract.

2. **DEFINITIONS:** As used in this Solicitation / Contract, the following terms shall have the meanings attributed to them below. Additional definitions may be found in the specifications included with this Solicitation / Contract.

   2.1 "Agency" or **"Agencies"** means the agency, board, commission, or other entity of the State of West Virginia that is identified on the first page of the Solicitation or any other public entity seeking to procure goods or services under this Contract.

   2.2 "Contract" means the binding agreement that is entered into between the State and the Vendor to provide the goods and services requested in the Solicitation.

   2.3 "Director" means the Director of the West Virginia Department of Administration, Purchasing Division.

   2.4 "Purchasing Division" means the West Virginia Department of Administration, Purchasing Division.

   2.5 "Purchase Order" means the document signed by the Agency and the Purchasing Division, and approved as to form by the Attorney General, that identifies the Vendor as the successful bidder and Contract holder.

   2.6 "Solicitation" means the official solicitation published by the Purchasing Division and identified by number on the first page thereof.

   2.7 "State" means the State of West Virginia and/or any of its agencies, commissions, boards, etc. as context requires.

   2.8 "Vendor" or **"Vendors"** means any entity submitting a bid in response to the Solicitation, the entity that has been selected as the lowest responsible bidder, or the entity that has been awarded the Contract as context requires.

3. **CONTRACT TERM; RENEWAL; EXTENSION:** The term of this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below:

| | | **Term Contract**

Initial Contract Term: This Contract becomes effective on [ ] and extends for a period of [ ] year(s).

Renewal Term: This Contract may be renewed upon the mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any request for renewal must be submitted to the Purchasing Division Director thirty (30) days prior to the expiration date of the initial contract term or appropriate renewal term. A Contract renewal shall be in accordance with the terms and conditions of the original contract. Renewal of this Contract is limited to [ ] successive one (1) year periods. Automatic renewal of this Contract is prohibited. Notwithstanding the foregoing, Purchasing Division approval is not required on agency delegated or exempt purchases. Attorney General approval may be required for vendor terms and conditions.

Reasonable Time Extension: At the sole discretion of the Purchasing Division Director, and with approval from the Attorney General's office (Attorney General approval is as to form only), this Contract may be extended for a reasonable time after the initial Contract term or after any renewal term as may be necessary to obtain a new contract or renew this Contract. Any reasonable time extension shall not exceed twelve (12) months. Vendor may avoid a reasonable time extension by providing the Purchasing Division Director with written notice of Vendor's desire to terminate this Contract 30 days prior to the expiration of the then current term. During any reasonable time extension period, the Vendor may terminate this Contract for any reason upon giving the Purchasing Division Director 30 days written notice. Automatic extension of this Contract is prohibited. Notwithstanding the foregoing, Purchasing Division approval is not required on agency delegated or exempt purchases, but Attorney General approval may be required.

| | **Fixed Period Contract:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within [ ] days.

|✓| **One Time Purchase:** The term of this Contract shall run for one year from the date the Purchase Order is issued or from the date the Purchase Order is issued until all of the goods contracted for have been delivered, whichever is shorter.

| | **Other:** See attached.

4. **NOTICE TO PROCEED:** Vendor shall begin performance of this Contract immediately upon receiving notice to proceed unless otherwise instructed by the Agency. Unless otherwise specified, the fully executed Purchase Order will be considered notice to proceed

5. **QUANTITIES:** The quantities required under this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below.

   | | **Open End Contract:** Quantities listed in this Solicitation are approximations only, based on estimates supplied by the Agency. It is understood and agreed that the Contract shall cover the quantities actually ordered for delivery during the term of the Contract, whether more or less than the quantities shown.

   | | **Service:** The scope of the service to be provided will be more clearly defined in the specifications included herewith.

   | | **Combined Service and Goods:** The scope of the service and deliverable goods to be provided will be more clearly defined in the specifications included herewith.

   |✓| **One Time Purchase:** This Contract is for the purchase of a set quantity of goods that are identified in the specifications included herewith. Once those items have been delivered, no additional goods may be procured under this Contract without an appropriate change order approved by the Vendor, Agency, Purchasing Division, and Attorney General's office.

6. **PRICING:** The pricing set forth herein is firm for the life of the Contract, unless specified elsewhere within this Solicitation/Contract by the State. A Vendor's inclusion of price adjustment provisions in its bid, without an express authorization from the State in the Solicitation to do so, may result in bid disqualification.

7. **EMERGENCY PURCHASES:** The Purchasing Division Director may authorize the Agency to purchase goods or services in the open market that Vendor would otherwise provide under this Contract if those goods or services are for immediate or expedited delivery in an emergency. Emergencies shall include, but are not limited to, delays in transportation or an unanticipated increase in the volume of work. An emergency purchase in the open market, approved by the Purchasing Division Director, shall not constitute of breach of this Contract and shall not entitle the Vendor to any form of compensation or damages. This provision does not excuse the State from fulfilling its obligations under a One Time Purchase contract.

8. **REQUIRED DOCUMENTS:** All of the items checked below must be provided to the Purchasing Division by the Vendor as specified below.

   | | **BID BOND:** All Vendors shall furnish a bid bond in the amount of five percent (5%) of the total amount of the bid protecting the State of West Virginia. The bid bond must be submitted with the bid.

[ ] **PERFORMANCE BOND:** The apparent successful Vendor shall provide a performance bond in the amount of [ ]. The performance bond must be issued and received by the Purchasing Division prior to Contract award. On construction contracts, the performance bond must be 100% of the Contract value.

[ ] **LABOR/MATERIAL PAYMENT BOND:** The apparent successful Vendor shall provide a labor/material payment bond in the amount of 100% of the Contract value. The labor/material payment bond must be issued and delivered to the Purchasing Division prior to Contract award.

In lieu of the Bid Bond, Performance Bond, and Labor/Material Payment Bond, the Vendor may provide certified checks, cashier's checks, or irrevocable letters of credit. Any certified check, cashier's check, or irrevocable letter of credit provided in lieu of a bond must be of the same amount and delivered on the same schedule as the bond it replaces. A letter of credit submitted in lieu of a performance and labor/material payment bond will only be allowed for projects under $100,000. Personal or business checks are not acceptable.

[ ] **MAINTENANCE BOND:** The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award.

[ ] **WORKERS' COMPENSATION INSURANCE:** The apparent successful Vendor shall have appropriate workers' compensation insurance and shall provide proof thereof upon request.

[ ] **INSURANCE:** The apparent successful Vendor shall furnish proof of the following insurance prior to Contract award:

[ ] **Commercial General Liability Insurance:** [ ] or more.

[ ] **Builders Risk Insurance:** builders risk – all risk insurance in an amount equal to 100% of the amount of the Contract.

[ ] [ ]

[ ] [ ]

[ ] [ ]

[ ] [ ]

[ ] [ ]

The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether or not that insurance requirement is listed above.

[ ] **LICENSE(S) / CERTIFICATIONS / PERMITS:** In addition to anything required under the Section entitled Licensing, of the General Terms and Conditions, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits prior to Contract award, in a form acceptable to the Purchasing Division.

[ ]	
[ ]	
[ ]	
[ ]	

The apparent successful Vendor shall also furnish proof of any additional licenses or certifications contained in the specifications prior to Contract award regardless of whether or not that requirement is listed above.

9. **LITIGATION BOND:** The Director reserves the right to require any Vendor that files a protest of an award to submit a litigation bond in the amount equal to one percent of the lowest bid submitted or $5,000, whichever is greater. The entire amount of the bond shall be forfeited if the hearing officer determines that the protest was filed for frivolous or improper purpose, including but not limited to, the purpose of harassing, causing unnecessary delay, or needless expense for the Agency. All litigation bonds shall be made payable to the Purchasing Division. In lieu of a bond, the protester may submit a cashier's check or certified check payable to the Purchasing Division. Cashier's or certified checks will be deposited with and held by the State Treasurer's office. If it is determined that the protest has not been filed for frivolous or improper purpose, the bond or deposit shall be returned in its entirety.

10. **ALTERNATES:** Any model, brand, or specification listed herein establishes the acceptable level of quality only and is not intended to reflect a preference for, or in any way favor, a particular brand or vendor. Vendors may bid alternates to a listed model or brand provided that the alternate is at least equal to the model or brand and complies with the required specifications. The equality of any alternate being bid shall be determined by the State at its sole discretion. Any Vendor bidding an alternate model or brand should clearly identify the alternate items in its bid and should include manufacturer's specifications, industry literature, and/or any other relevant documentation demonstrating the equality of the alternate items. Failure to provide information for alternate items may be grounds for rejection of a Vendor's bid.

11. **EXCEPTIONS AND CLARIFICATIONS:** The Solicitation contains the specifications that shall form the basis of a contractual agreement. Vendor shall clearly mark any exceptions, clarifications, or

other proposed modifications in its bid. Exceptions to, clarifications of, or modifications of a requirement or term and condition of the Solicitation may result in bid disqualification.

12. **LIQUIDATED DAMAGES:** Vendor shall pay liquidated damages in the amount [ ] for [ ] [ ]. This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy.

13. **ACCEPTANCE/REJECTION:** The State may accept or reject any bid in whole, or in part. Vendor's signature on its bid signifies acceptance of the terms and conditions contained in the Solicitation and Vendor agrees to be bound by the terms of the Contract, as reflected in the Purchase Order, upon receipt.

14. **REGISTRATION:** Prior to Contract award, the apparent successful Vendor must be properly registered with the West Virginia Purchasing Division and must have paid the $125 fee if applicable.

15. **COMMUNICATION LIMITATIONS:** In accordance with West Virginia Code of State Rules §148-1-6.6, communication with the State of West Virginia or any of its employees regarding this Solicitation during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited without prior Purchasing Division approval. Purchasing Division approval for such communication is implied for all agency delegated and exempt purchases.

16. **FUNDING:** This Contract shall continue for the term stated herein, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise made available, this Contract becomes void and of no effect beginning on July 1 of the fiscal year for which funding has not been appropriated or otherwise made available.

17. **PAYMENT:** Payment in advance is prohibited under this Contract. Payment may only be made after the delivery and acceptance of goods or services. The Vendor shall submit invoices, in arrears, to the Agency at the address on the face of the purchase order labeled "Invoice To."

18. **UNIT PRICE:** Unit prices shall prevail in cases of a discrepancy in the Vendor's bid.

19. **DELIVERY:** All quotations are considered freight on board destination ("F.O.B. destination") unless alternate shipping terms are clearly identified in the bid. Vendor's listing of shipping terms that contradict the shipping terms expressly required by this Solicitation may result in bid disqualification.

20. **INTEREST:** Interest attributable to late payment will only be permitted if authorized by the West Virginia Code. Presently, there is no provision in the law for interest on late payments.

21. **PREFERENCE:** Vendor Preference may only be granted upon written request and only in accordance with the West Virginia Code § 5A-3-37 and the West Virginia Code of State Rules. A Resident Vendor Certification form has been attached hereto to allow Vendor to apply for the preference. Vendor's

failure to submit the Resident Vendor Certification form with its bid will result in denial of Vendor Preference. Vendor Preference does not apply to construction projects.

22. **SMALL, WOMEN-OWNED, OR MINORITY-OWNED BUSINESSES:** For any solicitations publicly advertised for bid on or after July 1, 2012, in accordance with West Virginia Code §5A-3-37(a)(7) and W. Va. CSR § 148-22-9, any non-resident vendor certified as a small, women-owned, or minority-owned business under W. Va. CSR § 148-22-9 shall be provided the same preference made available to any resident vendor. Any non-resident small, women-owned, or minority-owned business must identify itself as such in writing, must submit that writing to the Purchasing Division with its bid, and must be properly certified under W. Va. CSR § 148-22-9 prior to submission of its bid to receive the preferences made available to resident vendors. Preference for a non-resident small, women-owned, or minority owned business shall be applied in accordance with W. Va. CSR § 148-22-9.

23. **TAXES:** The Vendor shall pay any applicable sales, use, personal property or any other taxes arising out of this Contract and the transactions contemplated thereby. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

24. **CANCELLATION:** The Purchasing Division Director reserves the right to cancel this Contract immediately upon written notice to the vendor if the materials or workmanship supplied do not conform to the specifications contained in the Contract. The Purchasing Division Director may cancel any purchase or Contract upon 30 days written notice to the Vendor in accordance with West Virginia Code of State Rules § 148-1-7.16.2.

25. **WAIVER OF MINOR IRREGULARITIES:** The Director reserves the right to waive minor irregularities in bids or specifications in accordance with West Virginia Code of State Rules § 148-1-4.6.

26. **TIME:** Time is of the essence with regard to all matters of time and performance in this Contract.

27. **APPLICABLE LAW:** This Contract is governed by and interpreted under West Virginia law without giving effect to its choice of law principles. Any information provided in specification manuals, or any other source, verbal or written, which contradicts or violates the West Virginia Constitution, West Virginia Code or West Virginia Code of State Rules is void and of no effect.

28. **COMPLIANCE:** Vendor shall comply with all applicable federal, state, and local laws, regulations and ordinances. By submitting a bid, Vendors acknowledge that they have reviewed, understand, and will comply with all applicable law.

29. **PREVAILING WAGE:** On any contract for the construction of a public improvement, Vendor and any subcontractors utilized by Vendor shall pay a rate or rates of wages which shall not be less than the fair minimum rate or rates of wages (prevailing wage), as established by the West Virginia Division of Labor under West Virginia Code §§ 21-5A-1 et seq. and available at http://www.sos.wv.gov/administrative-law/wagerates/Pages/default.aspx. Vendor shall be responsible for ensuring compliance with prevailing wage requirements and determining when prevailing wage

requirements are applicable. The required contract provisions contained in West Virginia Code of State Rules § 42-7-3 are specifically incorporated herein by reference.

30. **ARBITRATION:** Any references made to arbitration contained in this Contract, Vendor's bid, or in any American Institute of Architects documents pertaining to this Contract are hereby deleted, void, and of no effect.

31. **MODIFICATIONS:** This writing is the parties' final expression of intent. Notwithstanding anything contained in this Contract to the contrary, no modification of this Contract shall be binding without mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). **No Change shall be implemented by the Vendor until such time as the Vendor receives an approved written change order from the Purchasing Division.**

32. **WAIVER:** The failure of either party to insist upon a strict performance of any of the terms or provision of this Contract, or to exercise any option, right, or remedy herein contained, shall not be construed as a waiver or a relinquishment for the future of such term, provision, option, right, or remedy, but the same shall continue in full force and effect. Any waiver must be expressly stated in writing and signed by the waiving party.

33. **SUBSEQUENT FORMS:** The terms and conditions contained in this Contract shall supersede any and all subsequent terms and conditions which may appear on any form documents submitted by Vendor to the Agency or Purchasing Division such as price lists, order forms, invoices, sales agreements, or maintenance agreements, and includes internet websites or other electronic documents. Acceptance or use of Vendor's forms does not constitute acceptance of the terms and conditions contained thereon.

34. **ASSIGNMENT:** Neither this Contract nor any monies due, or to become due hereunder, may be assigned by the Vendor without the express written consent of the Agency, the Purchasing Division, the Attorney General's office (as to form only), and any other government agency or office that may be required to approve such assignments. Notwithstanding the foregoing, Purchasing Division approval may or may not be required on certain agency delegated or exempt purchases.

35. **WARRANTY:** The Vendor expressly warrants that the goods and/or services covered by this Contract will: (a) conform to the specifications, drawings, samples, or other description furnished or specified by the Agency; (b) be merchantable and fit for the purpose intended; and (c) be free from defect in material and workmanship.

36. **STATE EMPLOYEES:** State employees are not permitted to utilize this Contract for personal use and the Vendor is prohibited from permitting or facilitating the same.

37. **BANKRUPTCY:** In the event the Vendor files for bankruptcy protection, the State of West Virginia may deem this Contract null and void, and terminate this Contract without notice.

38. **HIPAA BUSINESS ASSOCIATE ADDENDUM**: The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, is available online at **http://www.state.wv.us/admin/purchase/vrc/hipaa.html** and is hereby made part of the agreement provided that the Agency meets the definition of a Covered entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the Vendor.

39. **CONFIDENTIALITY**: The Vendor agrees that it will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the Agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the Agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in http://www.state.wv.us/admin/purchase/privacy/default.html.

40. **DISCLOSURE:** Vendor's response to the Solicitation and the resulting Contract are considered public documents and will be disclosed to the public in accordance with the laws, rules, and policies governing the West Virginia Purchasing Division. Those laws include, but are not limited to, the Freedom of Information Act found in West Virginia Code § 29B-1-1 et seq.

    If a Vendor considers any part of its bid to be exempt from public disclosure, Vendor must so indicate by specifically identifying the exempt information, identifying the exemption that applies, providing a detailed justification for the exemption, segregating the exempt information from the general bid information, and submitting the exempt information as part of its bid but in a segregated and clearly identifiable format. Failure to comply with the foregoing requirements will result in public disclosure of the Vendor's bid without further notice. A Vendor's act of marking all or nearly all of its bid as exempt is not sufficient to avoid disclosure and WILL NOT BE HONORED. Vendor's act of marking a bid or any part thereof as "confidential" or "proprietary" is not sufficient to avoid disclosure and WILL NOT BE HONORED. In addition, a legend or other statement indicating that all or substantially all of the bid is exempt from disclosure is not sufficient to avoid disclosure and WILL NOT BE HONORED. Vendor will be required to defend any claimed exemption for nondisclosure in the event of an administrative or judicial challenge to the State's nondisclosure. Vendor must indemnify the State for any costs incurred related to any exemptions claimed by Vendor. Any questions regarding the applicability of the various public records laws should be addressed to your own legal counsel prior to bid submission.

41. **LICENSING:** In accordance with West Virginia Code of State Rules §148-1-6.1.7, Vendor must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agency or political subdivision. Upon request, the Vendor must provide all necessary releases to obtain information to enable the Purchasing Division Director or the Agency to verify that the Vendor is licensed and in good standing with the above entities.

42. **ANTITRUST:** In submitting a bid to, signing a contract with, or accepting a Purchase Order from any agency of the State of West Virginia, the Vendor agrees to convey, sell, assign, or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Vendor.

43. **VENDOR CERTIFICATIONS:** By signing its bid or entering into this Contract, Vendor certifies (1) that its bid was made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, person or entity submitting a bid for the same material, supplies, equipment or services; (2) that its bid is in all respects fair and without collusion or fraud; (3) that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; and (4) that it has reviewed this RFQ in its entirety; understands the requirements, terms and conditions, and other information contained herein. Vendor's signature on its bid also affirms that neither it nor its representatives have any interest, nor shall acquire any interest, direct or indirect, which would compromise the performance of its services hereunder. Any such interests shall be promptly presented in detail to the Agency.

    The individual signing this bid on behalf of Vendor certifies that he or she is authorized by the Vendor to execute this bid or any documents related thereto on Vendor's behalf; that he or she is authorized to bind the Vendor in a contractual relationship; and that, to the best of his or her knowledge, the Vendor has properly registered with any State agency that may require registration.

44. **PURCHASING CARD ACCEPTANCE:** The State of West Virginia currently utilizes a Purchasing Card program, administered under contract by a banking institution, to process payment for goods and services. The Vendor must accept the State of West Virginia's Purchasing Card for payment of all orders under this Contract unless the box below is checked.

    | | Vendor is not required to accept the State of West Virginia's Purchasing Card as payment for all goods and services.

45. **VENDOR RELATIONSHIP:** The relationship of the Vendor to the State shall be that of an independent contractor and no principal-agent relationship or employer-employee relationship is contemplated or created by this Contract. The Vendor as an independent contractor is solely liable for the acts and omissions of its employees and agents. Vendor shall be responsible for selecting, supervising, and compensating any and all individuals employed pursuant to the terms of this Solicitation and resulting contract. Neither the Vendor, nor any employees or subcontractors of the Vendor, shall be deemed to be employees of the State for any purpose whatsoever. Vendor shall be exclusively responsible for payment of employees and contractors for all wages and salaries, taxes, withholding payments, penalties, fees, fringe benefits, professional liability insurance premiums, contributions to insurance and pension, or other deferred compensation plans, including but not limited to, Workers' Compensation and Social Security obligations, licensing fees, *etc.* and the filing of all necessary documents, forms and returns pertinent to all of the foregoing. Vendor shall hold harmless the

State, and shall provide the State and Agency with a defense against any and all claims including, but not limited to, the foregoing payments, withholdings, contributions, taxes, Social Security taxes, and employer income tax returns.

46. **INDEMNIFICATION:** The Vendor agrees to indemnify, defend, and hold harmless the State and the Agency, their officers, and employees from and against: (1) Any claims or losses for services rendered by any subcontractor, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the Contract; (2) Any claims or losses resulting to any person or entity injured or damaged by the Vendor, its officers, employees, or subcontractors by the publication, translation, reproduction, delivery, performance, use, or disposition of any data used under the Contract in a manner not authorized by the Contract, or by Federal or State statutes or regulations; and (3) Any failure of the Vendor, its officers, employees, or subcontractors to observe State and Federal laws including, but not limited to, labor and wage and hour laws.

47. **PURCHASING AFFIDAVIT:** In accordance with West Virginia Code § 5A-3-10a, all Vendors are required to sign, notarize, and submit the Purchasing Affidavit stating that neither the Vendor nor a related party owe a debt to the State in excess of $1,000. The affidavit must be submitted prior to award, but should be submitted with the Vendor's bid. A copy of the Purchasing Affidavit is included herewith.

48. **ADDITIONAL AGENCY AND LOCAL GOVERNMENT USE:** This Contract may be utilized by and extends to other agencies, spending units, and political subdivisions of the State of West Virginia; county, municipal, and other local government bodies; and school districts ("Other Government Entities"). This Contract shall be extended to the aforementioned Other Government Entities on the same prices, terms, and conditions as those offered and agreed to in this Contract. If the Vendor does not wish to extend the prices, terms, and conditions of its bid and subsequent contract to the Other Government Entities, the Vendor must clearly indicate such refusal in its bid. A refusal to extend this Contract to the Other Government Entities shall not impact or influence the award of this Contract in any manner.

49. **CONFLICT OF INTEREST:** Vendor, its officers or members or employees, shall not presently have or acquire any interest, direct or indirect, which would conflict with or compromise the performance of its obligations hereunder. Vendor shall periodically inquire of its officers, members and employees to ensure that a conflict of interest does not arise. Any conflict of interest discovered shall be promptly presented in detail to the Agency.

50. **REPORTS:** Vendor shall provide the Agency and/or the Purchasing Division with the following reports identified by a checked box below:

[ ] Such reports as the Agency and/or the Purchasing Division may request. Requested reports may include, but are not limited to, quantities purchased, agencies utilizing the contract, total contract expenditures by agency, etc.

[ ] Quarterly reports detailing the total quantity of purchases in units and dollars, along with a listing of purchases by agency. Quarterly reports should be delivered to the Purchasing Division via email at purchasing.requisitions@wv.gov.

51. BACKGROUND CHECK: In accordance with W. Va. Code § 15-2D-3, the Director of the Division of Protective Services shall require any service provider whose employees are regularly employed on the grounds or in the buildings of the Capitol complex or who have access to sensitive or critical information to submit to a fingerprint-based state and federal background inquiry through the state repository.

After the contract for such services has been approved, but before any such employees are permitted to be on the grounds or in the buildings of the Capitol complex or have access to sensitive or critical information, the service provider shall submit a list of all persons who will be physically present and working at the Capitol complex to the Director of the Division of Protective Services for purposes of verifying compliance with this provision.

The State reserves the right to prohibit a service provider's employees from accessing sensitive or critical information or to be present at the Capitol complex based upon results addressed from a criminal background check.

52. PREFERENCE FOR USE OF DOMESTIC STEEL PRODUCTS: Except when authorized by the Director of the Purchasing Division pursuant to W. Va. Code § 5A-3-56, no contractor may use or supply steel products for a State Contract Project other than those steel products made in the United States. A contractor who uses steel products in violation of this section may be subject to civil penalties pursuant to W. Va. Code § 5A-3-56. As used in this section:

a. "State Contract Project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of and materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited on or after June 6, 2001.

b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or such operations, from steel made by the open heath, basic oxygen, electric furnace, Bessemer or other steel making process.

The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:

a. The cost for each contract item used does not exceed one tenth of one percent (.1%) of the total contract cost or two thousand five hundred dollars ($2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or

b. The Director of the Purchasing Division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

53. PREFERENCE FOR USE OF DOMESTIC ALUMINUM, GLASS, AND STEEL: In Accordance with W. Va. Code § 5-19-1 et seq., and W. Va. CSR § 148-10-1 et seq., for every contract or subcontract, subject to the limitations contained herein, for the construction, reconstruction, alteration, repair, improvement or maintenance of public works or for the purchase of any item of machinery or equipment to be used at sites of public works, only domestic aluminum, glass or steel products shall be supplied unless the spending officer determines, in writing, after the receipt of offers or bids, (1) that the cost of domestic aluminum, glass or steel products is unreasonable or inconsistent with the public interest of the State of West Virginia, (2) that domestic aluminum, glass or steel products are not produced in sufficient quantities to meet the contract requirements, or (3) the available domestic aluminum, glass, or steel do not meet the contract specifications. This provision only applies to public works contracts awarded in an amount more than fifty thousand dollars ($50,000) or public works contracts that require more than ten thousand pounds of steel products.

The cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than twenty percent (20%) of the bid or offered price for foreign made aluminum, glass, or steel products. If the domestic aluminum, glass or steel products to be supplied or produced in a "substantial labor surplus area", as defined by the United States Department of Labor, the cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than thirty percent (30%) of the bid or offered price for foreign made aluminum, glass, or steel products.

This preference shall be applied to an item of machinery or equipment, as indicated above, when the item is a single unit of equipment or machinery manufactured primarily of aluminum, glass or steel, is part of a public works contract and has the sole purpose or of being a permanent part of a single public works project. This provision does not apply to equipment or machinery purchased by a spending unit for use by that spending unit and not as part of a single public works project.

All bids and offers including domestic aluminum, glass or steel products that exceed bid or offer prices including foreign aluminum, glass or steel products after application of the preferences provided in this provision may be reduced to a price equal to or lower than the lowest bid or offer price for foreign aluminum, glass or steel products plus the applicable preference. If the reduced bid or offer prices are made in writing and supersede the prior bid or offer prices, all bids or offers, including the reduced bid or offer prices, will be reevaluated in accordance with this rule.

REQUEST FOR QUOTATION
MCH13049 – VALVED HOLDING CHAMBERS FOR pMDI's

SPECIFICATIONS

1. **PURPOSE AND SCOPE:** The West Virginia Purchasing Division is soliciting bids on behalf of the West Virginia Department of Health and Human Resources, Bureau for Public Health, Office of Maternal, Child and Family Health's Infant Child and Adolescent Health (ICAH) Program to establish a contract for the one time purchase of 6,560 valved holding chambers for pressurized metered dose inhalers (pMDI's) that will be distributed by ICAH to various medical care sites located across West Virginia. A DEA registration certificate will be provided to the vendor awarded a contract.

2. **DEFINITIONS:** The terms listed below shall have the meanings assigned to them below. Additional definitions can be found in section 2 of the General Terms and Conditions.

   2.1 **"Desired Item"** means Valved Holding Chamber for pressurized metered dose inhaler (pMDI).

   2.2 **"Bid Evaluation Page"** means the page upon which Vendor should list its proposed price for the Desired Item in the manner requested by thereon. The Desired Item is either included on the last page of this RFQ or attached hereto as Exhibit A.

   2.3 **"RFQ"** means the official RFQ published by the Purchasing Division and identified as MCH13049.

3. **GENERAL REQUIREMENTS:**

   3.1 **Mandatory Desired Item Requirements:** Desired Item must meet or exceed the mandatory requirements listed below.

      3.1.1 **Desired Item #1 – Valved Holding Chamber for pMDI**

         3.1.1.1 Must be compatible with Philips Healthcare OptiChamber Model Number 1077478, NDC Number 1077478. If bidding an alternate valved holding chamber, Vendor must clearly identify alternate chamber and provide manufacturer's specifications, industry literature, and/or any other relevant documentation that demonstrates the alternate chamber meets the following mandatory requirements.

            3.1.1.2.1 Must be suitable for patients of all ages.

3.1.1.2.2 Must have low resistance inspiratory and expiratory valves that open freely, even under low pediatric pressures and flows.

3.1.1.2.3 Must have a visible expiratory valve to help guide breath count and breath hold.

3.1.1.2.4 Must be designed with a stepped mouthpiece to facilitate transfer from pediatric mask to mouthpiece to avoid incurring cost of a new chamber.

3.1.1.2.5 Must have a flat bottom to maintain stability when unit is not in use.

3.1.1.2.6 Must interface with 22 millimeter connectors.

3.1.1.2.7 Must be anti-static for consistent aerosol therapy and be ready to use right out of the package.

3.1.1.2.8 Must have an adapter to securely hold the pMDI in place.

3.1.1.2.9 Must have an integrated high flow whistle to facilitate patient training of proper breathing technique.

3.1.1.2.10 Must be able to disassemble mouthpiece and adapter easily for hand cleaning with warm water and liquid detergent.

3.1.1.2.11 Must be latex free.

3.1.1.2.12 Must have a life span of one year.

3.1.1.2.13 Must have a one-year unconditional warranty that will allow ICAH Program or medical care site to request a replacement valved holding chamber for any unit that performs unsatisfactorily for any reason at no cost.

4. CONTRACT AWARD:

4.1 Contract Award: The Contract is intended to provide Agency with a purchase price for the Desired Item. The Contract shall be awarded to the Vendor that provides the Desired Item meeting the required specifications for the lowest overall total cost as shown on the Pricing Pages.

4.2 Bid Evaluation Page: Vendor should complete the Bid Evaluation Page by completing the Unit, Total, and Total Bid Price fields. The Total should be calculated by multiplying the Quantity by the Unit Price. The Total Bid Price should be calculated by adding the Total column. Vendor should complete the Vendor section in its entirety. Vendor should complete the Bid Evaluation Page in full as failure to complete the Bid Evaluation Page in its entirety may result in Vendor's bid being disqualified.

Notwithstanding the foregoing, the Purchasing Division may correct errors as it deems appropriate. Vendor should type or electronically enter the information into the Bid Evaluation Page to prevent errors in the evaluation.

5. PAYMENT:

5.1 Payment: Vendor shall accept payment in accordance with the payment procedures of the State of West Virginia. Methods of acceptable payment must include the West Virginia Purchasing Card. Payment in advance is not permitted under this Contract.

6. DELIVERY AND RETURN:

6.1 Shipment and Delivery: Vendor shall ship the Desired Item immediately after being awarded this Contract and receiving a purchase order or notice to proceed. Vendor shall deliver the Desired Item within 30 working days after receiving a purchase order or notice to proceed. Desired Item must be delivered to Agency at WV Department of Health and Human Resources, Materials Management Warehouse, 900 Bullit Street, Charleston, West Virginia 25301.

6.2 Late Delivery: The Agency placing the order under this Contract must be notified in writing if the shipment of the Desired Item will be delayed for any reason. Any delay in delivery that could cause harm to an Agency will be grounds for cancellation of the Contract, and/or obtaining the Desired Item from a third party.

Any Agency seeking to obtain the Desired Item from a third party under this provision must first obtain approval of the Purchasing Division.

6.3 **Delivery Payment/Risk of Loss:** Vendor shall deliver the Desired Item F.O.B. destination to the Agency's location.

6.4 **Return of Unacceptable Items:** If the Agency deems the Desired Item to be unacceptable, the Desired Item shall be returned to Vendor at Vendor's expense and with no restocking charge. Vendor shall either make arrangements for the return within five (5) days of being notified that items are unacceptable, or permit the Agency to arrange for the return and reimburse Agency for delivery expenses. If the original packaging cannot be utilized for the return, Vendor will supply the Agency with appropriate return packaging upon request. All returns of unacceptable items shall be F.O.B. the Agency's location. The returned product shall either be replaced, or the Agency shall receive a full credit or refund for the purchase price, at the Agency's discretion.

6.5 **Return Due to Agency Error:** Items ordered in error by the Agency will be returned for credit within 30 days of receipt, F.O.B. Vendor's location. Vendor shall not charge a restocking fee if returned products are in a resalable condition. Items shall be deemed to be in a resalable condition if they are unused and in the original packaging. Any restocking fee for items not in a resalable condition shall be the lower of the Vendor's customary restocking fee or 5% of the total invoiced value of the returned items.

REQUEST FOR QUOTATION
MCH13049 – VALVED HOLDING CHAMBERS FOR pMDI's

BID EVALUATION

Desired Item #	Quantity	Description	Unit Price	Total
#1 (3.1.1)	6,560	Monaghan Z STAT(r)("aVHC")$4.75 ea Valved Holding Chamber for pMDI PN# 79750Z /cs 50	= $237.50/cs	$31,160.00
			Total Bid Price	$31,161.00

Vendor Name: Monaghan Medical Corporation

Vendor Address: 5 LaTour Avenue Suite 1600

Plattsburgh NY 12901

Vendor Telephone Number: 800-833-9653

Vendor Fax Number: 518-561-5088

Vendor Email: customerservice@monaghanmed.com

Vendor Authorized Representative: Jon Schoeler
(Please Print)

Vendor Authorized Representative Signature: Jon Schoeler

Date: 9/21/12

****BID WILL BE AWARD TO LOWEST GRAND TOTAL BID MEETING SPECIFICATIONS.****

Rev. 07/12

State of West Virginia

VENDOR PREFERENCE CERTIFICATE

Certification and application* is hereby made for Preference in accordance with ***West Virginia Code***, §5A-3-37. (Does not apply to construction contracts). ***West Virginia Code***, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the ***West Virginia Code***. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Resident Vendor Preference, if applicable.

1. **Application is made for 2.5% resident vendor preference for the reason checked:**

____ Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**

____ Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**

____ Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or,**

2. **Application is made for 2.5% resident vendor preference for the reason checked:**

____ Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

3. **Application is made for 2.5% resident vendor preference for the reason checked:**

____ Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

4. **Application is made for 5% resident vendor preference for the reason checked:**

____ Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or,**

5. **Application is made for 3.5% resident vendor preference who is a veteran for the reason checked:**

____ Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or,**

6. **Application is made for 3.5% resident vendor preference who is a veteran for the reason checked:**

____ Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

7. **Application is made for preference as a non-resident small, women- and minority-owned business, in accordance with *West Virginia Code* §5A-3-59 and *West Virginia Code of State Rules*.**

____ Bidder has been or expects to be approved prior to contract award by the Purchasing Division as a certified small, women- and minority-owned business.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: _____ **Signed:** _____

Date: _____ **Title:** _____

RFQ No. MCH13049

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Monaghan Medical Corporation

Authorized Signature: _____ Date: 9/24/12

State of New York

County of Clinton, to-wit:

Taken, subscribed, and sworn to before me this 24 day of September, 2012

My Commission expires February 19, 2014

AFFIX SEAL HERE

NOTARY PUBLIC Kathie L Cameron Murray

KATHIE L. CAMERON-MURRAY
Notary Public - State of New York
Reg. #01S16070089
Qualified in Clinton County
Commission Expires February 19, 2014

CERTIFICATION AND SIGNATURE PAGE

By signing below, I certify that I have reviewed this Solicitation in its entirety; understand the requirements, terms and conditions, and other information contained herein; that I am submitting this bid or proposal for review and consideration; that I am authorized by the bidder to execute this bid or any documents related thereto on bidder's behalf; that I am authorized to bind the bidder in a contractual relationship; and that to the best of my knowledge, the bidder has properly registered with any State agency that may require registration.

Monaghan Medical Corporation
(Company)

(Authorized Signature)

Jon Schoeler V.P Sales & Marketing
(Representative Name, Title)

800-343-9071 518-561-5088
(Phone Number) (Fax Number)

9/24/12
(Date)

More Time to Breathe Easy

Increased aerosol suspension time gives *everyone* more time to breathe easy

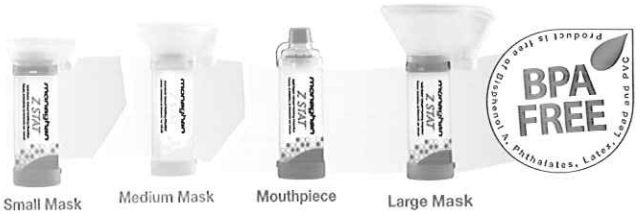
FLOWSIGnal® Whistle
alerts patients of improper technique when the patient inhales too quickly

Flow Dynamic Valve and Baffle System
prevents patients from exhaling into the chamber, ensuring the remaining medication is available for the next breath

Anti-Static Chamber
provides consistent aerosol delivery right out of the package

Universal pMDI Adapter
fits commonly prescribed pMDIs for easy insertion and removal of pMDIs

Consumer Friendly
- Easier to read user instructions
- Visually appealing design



More Time to Breathe Easy.

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Z STAT™
Anti-Static Valved Holding Chamber

The same Z STAT® aVHC* found in hospitals is available *to you*...

Small Mask

Medium Mask

Mouthpiece

Large Mask

Ordering Information		
Part #	Description	Case/Each
79710Z	*Monaghan* Z STAT® aVHC	case/10
79750Z	*Monaghan* Z STAT® aVHC	case/50
88710Z	*Monaghan* Z STAT® aVHC w/SM *ComfortSeal*® Mask	case/10
78710Z	*Monaghan* Z STAT® aVHC w/MED *ComfortSeal*® Mask	case/10
80710Z	*Monaghan* Z STAT® aVHC w/LRG *ComfortSeal*® Mask	case/10

For more information or a demonstration, contact your Monaghan sales rep:

Combining over 25 years experience in aerosol delivery and chamber design

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Monaghan Medical Corporation, 5 Latour Ave., Suite 1600, Plattsburgh, NY 12901, Customer Service 800-833-9653
www.monaghanmed.com

*aVHC = Anti-Static Valved Holding Chamber

monaghan
Z STAT™
Anti-Static Valved Holding Chamber

PN 79704-01 06/10

AeroChamber® Valved Holding Chamber (VHC) In Vivo Clinical Summary

The following summaries have been extracted from various journals and resources to produce a comprehensive analysis of in vivo clinical data

- Emergency Department (ED) education of parents with the *AeroChamber*® VHC improved children's metered dose inhaler (MDI) adherence at home. [1]
- In adult and pediatric asthma patients use of MDI's with the *AeroChamber*® VHC (with and without mask) is equivalent to SVN (with and without mask), and avoids exposing clinicians to fugitive emissions and allows time for patient technique training. [2,3]
- Use of the *AeroChamber*® VHC and proper technique (slow inhalation with breath hold) can significantly improve lung deposition with HFA beclomethasone. [8]
- The *AeroChamber*® VHC has a small chamber volume and was chosen for use in this study due to optimal in vitro characteristics and ease of use. [8]
- The *AeroChamber*® VHC has been extensively studied in vivo with many MDI's
  - Flovent† (fluticasone propionate) [7,9,10,11,13,16,17,19]
  - Fluticasone was found to be clinically safe and to significantly improve asthma control using the *AeroChamber*® VHC with children 1-4 years of age. [16,17]
  - Alvesco† (ciclesonide) [4,20]
  - QVAR† (beclomethasone) [8]
  - Sereventt (salbutamol) [12,28]
  - HFA and CFC Albuterol [21]
- The *AeroChamber*® VHC *ComfortSeal*® mask design is recognized as superior in terms of fit, dead space, seal, and efficient aerosol delivery. [5,6,26]
- The *AeroChamber*® VHC improves deposition in 5-9 year olds (with mouthpiece) and 1-4 year olds (with mask) relative to older children using MDIs with no VHC. [13]
- The *AeroChamber*® VHC design and size is associated with correct usage and improved drug delivery and is the most prescribed VHC by health care professionals. [14,15]
- The anti-static *AeroChamber*® VHC improved fine particle deposition up to 70% in children. [11,13,19]
- Use of *AeroChamber*® VHC in ED's have reduced costs, admissions, decreased treatment time, had fewer complications and lowered readmission rates in adults and children and when compared to SVN's. [22,23,27,29]
- Properly used, the *AeroChamber*® VHC with MDI is equivalent to the *AeroEclipse*® nebulizer in the COPD population. [25]
- The *AeroChamber*® VHC is recommended for patients with poor coordination. [18,20,24]

monaghan™

1 DOES PARENTAL INVOLVEMENT IN PEDIATRIC EMERGENCY DEPARTMENT ASTHMA TREATMENT AFFECT HOME MANAGEMENT?

Hussain-Rizvi A, Kunkov S, Crain EF

Study Found

Journal of Asthma. 2009 46(8):792-795.

Synopsis

To determine whether parents who deliver albuterol treatments in a pediatric emergency department with a metered dose inhaler with a space (MDIS) report better adherence to MDIS use at home compare to parents whose children undergo standard nebulizer therapy. Children aged 1-5 years were randomized by day to usual treatment with nebulized albuterol (40 children) or to treatment by the parent with albuterol with an MDIS (46 children). All caregivers received standard discharge instructions, a space and an MDI. Two weeks following the visit, a trained research assistant blinded to the child's group status, administered a brief telephone questionnaire to each caretaker. At follow-up, children in the MDIS group were 7.5 times more likely to be using the MDIS for their albuterol treatments (95%CI 1.6-35.6). Involving parents in treatment of asthma exacerbations in the emergency department using an MDIS may improve adherence to MDIS use at home.

2 COMPARISON OF VALVED-HOLDING CHAMBER (VHC)-FACEMASK/ MOUTHPIECE WITH SMALL VOLUME NEBULIZER-FACEMASK FOR BRONCHODILATOR DELIVERY

Hart M, Abmas E, Hernandez G, Boehm R, et al.

Study Found

Poster Presented at: European Respiratory Society Conference; 2009 Sept 12-16; Vienna, Austria.

Synopsis

Aerosolized medications now represent the standard-of-care for asthma. We report a preliminary study to test the hypothesis that treatment by anti-static VHC-face mask (Aerochamber MAX® Monaghan Medical Corp., Plattsburgh, NY, USA) is as effective as via nebulizer-face mask based on FEV, and dyspnea responses. 8 adult subjects diagnosed with asthma demonstrating a ≥200 ml FEV, response to inhaled albuterol by spirometry were randomized to 5 treatment modalities: (1) 2-actuations by metered dose inhaler (pMDI)+VHC-mouthpiece (2) 4-actuations pMDI+VHC- mouthpiece (3) 2-actuations pMDI+VHC-face mask (4) 4-actuations pMDI+VHC (5) unit dose (3ml, 2.5mg) ampoule via small volume nebulizer. Each subject was evaluated by a different treatment on 5 consecutive mornings withholding their beta-agonist prior to testing. Heart rate, oxygen saturation, perceived work of breathing (BORG), and hand tremor was assessed prior to testing, 15, 30 minutes post treatment. Using BORG as a measure of effective delivery, all methods except (5) were shown to be statistically significant ($p<0.05$) when comparing mean ANOVA methods at baseline, 15, 30 minutes. Mean FEV, at both 15, 30 minutes post treatment was measurably higher than baseline values across treatment methods correlating with BORG findings. No side effects were noted during the study. Although the study demonstrated substantial equivalence between treatments, additional subjects must be studied to improve statistical power. The pMDI+VHC method avoids exposing the therapist to fugitive albuterol emissions and allows the respiratory therapist time to train the patient in correct inhaler technique.

3 THE CONVERSION TO METERED-DOSE INHALER WITH VALVED HOLDING CHAMBER TO ADMINISTER INHALED ALBUTEROL: A PEDIATRIC HOSPITAL EXPERIENCE

DiBlasi RM, Crotwell DN, Cowan CA, Carter ER, Salyer JW

Study Found

Resp Care. 2008 March;53(3):338-345.

Synopsis

INTRODUCTION: Inhaled bronchodilators are one of the most frequently prescribed medications for children hospitalized with respiratory disorders. Historically, the most common method of administration has been via the small-volume nebulizer (SVN). The methods and effectiveness by which these medications are administered to pediatric patients has been evaluated extensively over the last decade. There is a large body of literature that indicated that the metered-dose inhaler with valved holding chamber (MDI_VHC) is at least as effective as SVN for the delivery of bronchodilators to infants, children and adults. In the past it was thought that young children were unable to use MDIs because they could not coordinate inhalation and that these devices would not be effective in delivery of bronchodilators. However, with the use of VHCs with face masks, infants and small children can now be successfully treated via MDI.

4 COMPARISON OF THE EFFICACY AND SAFETY OF CICLESONIDE 160 MICROG ONCE DAILY VS. BUDESONIDE 400 MICROG ONCE DAILY IN CHILDREN WITH ASTHMA

Von Berg A, Engelstätter R, Minic P, Sréckovic M, Garcia ML, Latoś T, Vermeulen JH, Leichtl S, Hellbardt S, Bethke TD

Study Found
Pediatr Allergy Immunol. 2007 Aug;18(5):391-400.

Synopsis
Ciclesonide is an onsite-activated inhaled corticosteroid (ICS) for the treatment of asthma. This study compared the efficacy, safety and effect on quality of life (QOL) of ciclesonide 160 microg (ex-actuator; nominal dose 200 microg) vs. budesonide 400 microg (nominal dose) in children with asthma. Six hundred and twenty-one children (aged 6-11 yr) with asthma were randomized to receive ciclesonide 160 microg (ex-actuator) once daily (via hydrofluoroalkane metered-dose inhaler and AeroChamber Plus* spacer) or budesonide 400 microg once daily (via Turbohaler((R))) both given in the evening for 12 wk. The primary efficacy end-point was change in forced expiratory volume in 1 s (FEV(1)). Additional measurements included change in daily peak expiratory flow (PEF), change in asthma symptom score sum, change in use of rescue medication, paediatric and caregiver asthma QOL questionnaire [PAQLQ(S) and PACQLQ, respectively] scores, change in body height assessed by stadiometry, change in 24-h urinary cortisol adjusted for creatinine and adverse events. Both ciclesonide and budesonide increased FEV(1), morning PEF and PAQLQ(S) and PACQLQ scores, and improved asthma symptom score sums and the need for rescue medication after 12 wk vs. baseline. The non-inferiority of ciclesonide vs. budesonide was demonstrated for the change in FEV(1) (95% confidence interval: -75, 10 ml, $p = 0.0009$, one-sided non-inferiority, perprotocol). In addition, ciclesonide and budesonide showed similar efficacy in improving asthma symptoms, morning PEF, use of rescue medication and QOL. Ciclesonide was superior to budesonide with regard to increases in body height ($p = 0.003$, twosided). The effect on the hypothalamic-pituitary-adrenal axis was significantly different in favor of ciclesonide treatment ($p < 0.001$, one-sided). Both ciclesonide and budesonide were well tolerated. Ciclesonide 160 microg once daily and budesonide 400 microg once daily were effective in children with asthma. In addition, in children treated with ciclesonide there was significantly less reduction in body height and suppression of 24-h urinary cortisol excretion compared with children treated with budesonide after 12 wk.

5 FACEMASKS AND AEROSOL DELIVERY IN VIVO

Erzinger S, Schueepp K, Brooks-Wildhaber J, Devadason S, Wildhaber J

Study Found
J of Aerosol Med. 2007;20(S1):S78-83.

Synopsis
It has been shown in vitro that even a small air leak in the facemask can drastically reduce the efficiency of drug delivery. In addition, it has been shown that drug deposition on the face does significantly add to overall drug loss and has the potential of local side effects. The aim of this study is therefore to verify these findings in vivo. Eight asymptomatic recurrently wheezy children, aged 18-36 months, inhales a radiolabeled salbutamol formulation either from a pressurized metered-dose inhaler through a spacer with attached facemask or from a nebulizer with attached facemask. Drug deposition of radiolabeled salbutamol was assessed with a gamma camera and expressed as a percentage of the total dose. Lung deposition expressed as a percentage of the total dose (metered dose and nebulizer fill, respectively) was 0.2% and 0.3% in children who inhaled with a non-tightly fitted facemask. Lung deposition was 0.6% and 1.4% in screaming children with a tightly fitted facemask and between 4.8% and 8.2% in patients breathing normally. Overall mask deposition was between 0.8% and 5.2%. Overall face deposition was between 2.6% and 8.4%. The results from this pilot study support the results found in in vitro studies, where a facemask leak greatly reduces drug deposition to the patient. "A facemask should have an effective seal, be flexible and soft with a large inward curved rim and have minimal dead space."

6 FACEMASKS AND AEROSOL DELIVERY BY METERED DOSE INHALER – VALVED HOLDING CHAMBER IN YOUNG CHILDREN: A TIGHT SEAL MAKES THE DIFFERENCE

Janssens HM, Tiddens HAWM

Study Found
J of Aerosol Med. 2007;20(S1):S59-63.

Synopsis
A facemask on a valved holding chamber (VHC) facilitates the inhalation of aerosols from metered dose inhalers (MDI) for young children. Only recently the facemask has been recognized as a vital part for efficient aerosol delivery. Several in vitro and in vivo studies show that a tight seal of the facemask is crucial for optimal aerosol deposition to the lungs. Even a small leak can reduce the dose delivered to the lungs considerably. However, a tight seal is difficult to obtain when a child is not cooperative. Depending on the design of the facemask, it is easier to obtain a good seal. Factors such as dead space, shape, and material should be considered when designing a facemask. However, when a child is upset and not cooperative during the administration, aerosol deposition will be minimal, even with the best-designed facemask.

7 EFFICACY AND SAFETY OF FLUTICASONE PROPIONATE HYDROFLUOROALKANE INHALATION AEROSOL IN PRE-SCHOOL-AGE CHILDREN WITH ASTHMA: A RANDONIZED, DOUBLE-BLIND, PLACEBO-CONTROLLED STUDY

Qaqundah PY, Sugerman RW, Ceruti E, Maspero JF, Kleha JF, Scott CA, Wu W, Mehta R and Crim C

Study Found

The Journal of Pediatrics. May 2007;150(5):565.

Synopsis

OBJECTIVE: To evaluate the efficacy and tolerability of fluticasone propionate (FP) hydrofluoroalkane (HFA) in children age 1 to < 4 years with asthma. STUDY DESIGN:Children were assigned (2:1) to receive FP HFA 88 µg (n = 239) or placebo HFA (n = 120) twice daily through a metered-dose inhaler with a valved holding chamber and attached facemask (AeroChamber Plus* VHC) for 12 weeks. The primary efficacy measure was mean percent change from baseline to endpoint in 24-hour daily (composite of daytime and nighttime) asthma symptom scores. RESULTS: The FP-treated children had significantly greater ($P \leq .05$) reductions in 24-hour daily asthma symptom scores (–53.9% vs –44.1%) and nighttime symptom scores over the entire treatment period compared with the placebo group. Daytime asthma symptom scores and albuterol use were slightly more decreased with FP than with placebo; however, the differences were not statistically significant. Increases in the percentage of symptom-free days were comparable. The percentage of patients who experienced at least 1 adverse event was similar in the 2 groups. Baseline median urinary cortisol excretion values were comparable between the groups, and there was little change from baseline at endpoint. FP plasma concentrations demonstrated that systemic exposure was low. CONCLUSIONS: FP HFA 88 µg twice daily was effective and well tolerated in pre–school-age children with asthma.

8 SPACER INHALATION TECHNIQUE AND DEPOSITION OF EXTRAFINE AEROSOL IN ASTHMATIC CHILDREN

Roller CM, Zhang G, Troedson RG, Leach CL, Le Souëf PN and Devadason SG

Study Found

Eur Respir J. 2007;29:299-306.

Synopsis

The aim of the present study was to measure airway, oropharyngeal and gastrointestinal deposition of 99mTclabelled hydrofluoroalkane-beclomethasone dipropionate after inhalation via a pressurized metered-dose inhalerand spacer (AeroChamber Plus* VHC) in asthmatic children. A group of 24 children (aged 5-17 yrs) with mild asthma inhaled the labeled drug. A total of 12 children took five tidal breaths after each actuation (tidal group). The other 12 children used a slow maximal inhalation followed by a 5-10-s breath-hold (breath-hold group). Simultaneous anterior and posterior planar y-scintigraphic scans (120-s acquisition) were recorded. For the tidal group, mean ±SD lung deposition (% ex-actuator, attenuation corrected) was 35.4± 18.3, 47.5±13.0 and 54.9±11.2 in patients aged 5-7 (n=4), 8-10 (n=4) and 11-17 yrs (n=4), respectively. Oropharyngeal and gastrointestinal deposition was 24.0±10.5, 10.3±4.4 and 10.1±6.2. With the breath-hold technique, lung deposition was 58.1±6.7, 56.6±5.2 and 58.4±9.2. Oropharyngeal and gastrointestinal deposition was 12.9±3.2, 20.1±9.5 and 20.8±8.8. Inhalation of the extrafine formulation with the breath-hold technique showed significantly improved lung deposition compared with tidal breathing across all ages. Oropharyngeal and gastrointestinal deposition was markedly decreased, regardless of which inhalation technique was applied, compared with a previous paediatric study using the same formulation delivered via a breath-actuated metered-dose inhaler.

9 PRESCRIBING INFORMATION - FLOVENT® HFA PRODUCT MONOGRAPH, USA, JAN, 2007

-Flovent® HFA 44 mcg (fluticasone propionate 44 mcg) Inhalation Aerosol
-Flovent® HFA 110 mcg (fluticasone propionate 110 mcg) Inhalation Aerosol
-Flovent® HFA 220 mcg (fluticasone propionate 220 mcg) Inhalation Aerosol

Excerpt from Monograph:

Pediatric: Two pharmacokinetic studies evaluated the systemic exposure to fluticasone propionate at steady state in children with asthma aged 4 to 11 years following inhalation of fluticasone propionate HFA. In an open-label, multiple-dose, 2-period crossover study, 13 children aged 4 to 11 years received 88 mcg of fluticasone propionate HFA twice daily for 7.5 days in one period and 88 mcg of fluticasone propionate CFC twice daily for 7.5 days in the other period. The geometric means (95% CI) of AUC(last) were 28 pg•hr/mL (10, 80) following fluticasone propionate HFA and 65 pg•hr/mL (27, 153) following fluticasone propionate CFC, indicating that systemic exposure was 55% lower using fluticasone propionate HFA. The geometric means (95% CI) of Cmax were 15.1 pg/mL (8.5, 27) following fluticasone propionate HFA and 20.4 pg/mL (13, 32) following fluticasone propionate CFC, indicating that Cmax was 26% lower using fluticasone propionate HFA. Tmax was similar for both treatments. AUClast and Cmax in this pediatric population were 37% and 60%, respectively, of those in adult patients receiving the same dose.

In a second open-label, single-dose, 2-period crossover study, 21 children with asthma aged 5 to 11 years received 264 mcg of fluticasone propionate HFA administered with and without an AeroChamber Plus™ Valved Holding Chamber (VHC). The geometric means (95% CI) of AUClast were 261 pg•hr/mL (252, 444) with the use of the VHC and 40 pg•hr/mL (16, 208) without the VHC. The geometric means (95% CI) of Cmax were 52 pg/mL (46, 70) with the VHC and 19 pg/mL (17, 41) without the VHC. The median Tmax was 1 hour with or without the VHC.

Therefore, systemic exposure was higher with the VHC in these pediatric patients with asthma.

10 LUNG BIOAVAILABILITY OF HYDROFLUOROALKANE FLUTICASONE IN YOUNG CHILDREN WHEN DELIVERED BY AN ANTISTATIC CHAMBER/MASK

Khan Y, Tang Y, Hochhaus G, Shuster JJ, Spencer T, Chesrown S, Hendeles L.

Study Found

J of Pedatrics. 2006 Dec;149(6):793-797.

Synopsis

OBJECTIVE: To determine whether an antistatic valved holding chamber/mask improves lung bioavailability of hydrofluoroalkane (HFA) fluticasone in young children. STUDY DESIGN: Twelve patients, age 1 to 6 years, with well-controlled asthma were treated with an HFA fluticasone metered-dose inhaler (Flovent HFA) twice daily (440 microg/day). The drug was delivered by tidal breathing through conventional (AeroChamber Plus) and antistatic (AeroChamber MAX) valved holding chambers (VHCs) with masks in a randomized, crossover manner, each for 3 to 7 days. When adherence was 100% at home, blood was collected for measurement of steady-state fluticasone plasma concentration (FPC) 1 hour after the last dose was administered in the clinic. FPC indicates systemic exposure directly and airway delivery indirectly. It was measured by liquid chromatography-mass spectrometry. Data was analyzed by regression analysis. RESULTS: The mean +/- SD FPC was 107 +/- 30 pg/mL after conventional VHC and 186 +/- 134 pg/mL after the antistatic VHC (P = .03). In 5 patients (40%), the antistatic VHC increased FPC by >/= 100%, to potentially excessive levels in 4 of them; it had little effect in 7 patients. CONCLUSIONS: HFA fluticasone was delivered to the airways by both devices even though the patients could not inhale deeply and breath hold. The antistatic VHC variably increased lung bioavailability. To reduce systemic exposure, the dose should be weaned to the minimum required to maintain asthma control.

11 SYSTEMIC EXPOSURE FOLLOWING FLUTICASONE PROPIONATE METERED DOSE INHALER USING HYDROFLUOROALKANE PROPELLANT WITH VALVED HOLDING CHAMBERS AND FACE-MASKS IN PRE-SCHOOL CHILDREN

Blake K, Hendeles L, Spencer T, Mehta R, Beerahee M, Daley-Yates P and Kunka R.

Study Found

Poster Presented at: 2006 Annual Meeting of the American College of Clinical Pharmacy; 2006 October 29;. St. Louis, Missouri.

Valved holding chambers with masks are often used with metered-dose inhalers in children with asthma to deliver drug to the lungs. Differences in holding chamber design can influence the amount of drug delivered. Lung deposition of fluticasone propionate (FP) using hydrofluoroalkane (HFA) propellant was examined using the AeroChamber Plus* and Babyhaler valved holding chambers. Children 1 to <4 years old were randomized in an open-label, 2-way crossover design (no washout between treatments) to receive 88 µg (44 µg/actuation) twice daily (every 12 hours) for 7.5 days (15 doses) using the AeroChamber Plus* VHC and Babyhaler with face-masks (FAS10002). The first and last 4 doses were directly observed by study staff. To limit the amount of blood collected from any one patient, children were randomized to one of three groups for blood sampling: Group 1: pre-dose, and 0.5-1, 1.5-2, 2.5-3, 3.5-4 hours post-dose: Group 2: 2.5-3, 3.5-4, 4.5-5, 6.5-7, 7.5-8 hrs post-dose; Group 3: 7.5-8, 8.5-9, 9.5-10, 11.5-12, post-dose, 12.5-13 hrs (0.5-1 hrs hour post dose #16). FP systemic exposure as described by area under the curve (AUC) was determined by population pharmacokinetics. Seventeen and 18 children completed AeroChamber* and Babyhaler treatments, respectively: one child completed only the Babyhaler treatment. Population mean (95% confidence interval) for FP exposure following dosing with the AeroChamber Plus* VHC was 97pg*h/ml (85, 113) and with the Babyhaler was 52pg*h/ml (34, 64). Lung deposition of FP through the AeroChamber Plus* VHC was higher when compared to the Babyhaler. However, systemic exposure for both devices was well below the threshold observed for decreses in cortisol production. Thus, both devices provide safe delivery of FP HFA to young children.

12 SIMILAR LUNG AND SYSTEMIC DELIVERY CHARACTERISTICS OF SALBUTAMOL FROM AN AEROCHAMBER PLUS* VHC AND A VOLUMATIC

Mazhar SHR, Chrystyn H.

Study Found

Poster Presented at: International Conference American Thoracic Society Conference; 2006 May 23; San Diego, CA.

Synopsis

We have shown that the amount of urinary salbutamol excreted in the first 30 minutes (USAL0.5) represents the relative lung deposition and the 24 hour salbutamol plus its metabolite excretion (USAL24) indicates the total systemic delivery following an inhalation (Hindle and Chrystyn. Brit J Clin Pharmacol 1992; 34: 311-5). We have used these in-vivo methods together with invitro characterisation of the emitted dose using an Andersen Cascade Impactor (ACI) to compare the Volumatic (VOL) and AeroChamber Plus* (AERO). Spacers were attached to a salbutamol CFC free metered dose inhaler (MDI). 13 subjects, mean (SD) 31.2(7.6) years and 64.9 (10.9) Kg completed the in-vivo study. The in-vitro and in-vivo results were: (we will recreate the proper chart to show these results in final version)

Mean (SD) from two 100ug doses (μg except MMAD μm)

	MDI	MDI + VOL	MDI + AERO
ACI			
Spacer		74.9(6.1)	90.6(6.7)
TED	176.6(7.6)	94.9(4.6)	85.3(4.5)
Throat	93.6(7.4)	11.3(1.9)	11.7(1.2)
FDP	41.5(3.4)	41.8(2.3)	36.8(1.5)
MMAD	2.69(0.03)	2.76(0.07)	2.9(0.10)
Urinary salbutamol			
USAL0.5	5.71(1.9)	16.36(8.2)	14.4(7.6)
USAL25	100.2(16.7)	97.3(12.7)	84.6(25.8)

TED - total emitted dose; Throat - ACI throat+S0+S1; FPD - fine particle dose, ACI S2-filter; MMAD - mass median aerodynamic diameter. Statistical analysis of the USAL0.5 data revealed no difference between the two spacers (mean difference [95% confidence interval] of 1.9[-4.5,8.3]μ g). USAL 0.5 VOL and AERO were each greater ($p<0.001$) than MDI alone (mean difference [95%CI] of 10.6[4.2,17.1] and 8.7[2.3,15.1]μ g, respectively). USAL24 amounts were all similar. The invitro characteristics suggest that slightly more salbutamol will be delivered to the lungs from a Volumatic than an AeroChamber Plus* VHC. The in-vivo data confirms this but the difference, as predicted by the in-vitro data, is only small. The results are consistent with the smaller size of the AeroChamber Plus*.

13 RELATIVE AMOUNT OF FLUTICASONE DELIVERED BY HFA-MDI TO CHILDREN OF DIFFERENT AGES

Khan YR.

Study Found

J Allergy Clin Immunol 2006 Feb;117(2):S91.

Synopsis

RATIONALE: We hypothesized that less fluticasone propionate (FP) is delivered by MDI to the airways of children <5 yr who passively inhale through a mask/valved holding chamber (VHC) than to older children who inhale deeply and breath hold. The 1-hr steady-state FP plasma concentration was used as an indirect measure of the relative amount deposited in the lungs and a direct measure of systemic exposure. METHODS: Sixty children with well controlled persistent asthma received FP 2x110 µg BID for ≥ 3 days, delivered by HFA-MDI through a device they used effectively. This higher dose is routine in our clinic. 100% adherence, documented by electronic monitor, was required. Five groups of 12 each were studied; 1) 12-18 yr by actuator alone; 2) 5-9 yr by actuator alone; 3) 5-9 yr by antistatic VHC/mouthpiece (AeroChamber MAX*); 4) 5-9 yr by antistatic VHC/mask; and 5) 1-4 yr by antistatic VHC/mask. FP was measured by an LC-MS/MS assay with a 13% CV for precision at 5 pg/ml. RESULTS: The mean±SD concentrations in pg/mL were: 12-18 yr actuator, 76±61; 5-9 yr actuator, 87±80; 5-9 yr VHC/mouthpiece, 207±149; 5-9 yr VHC/mask, 140±61; and 1-4 yr VHC/mask, 165±58. The mean concentration in the 12-18 yr actuator group was significantly lower than VHC groups (p=0.003), but not different from the 5-9 yr actuator alone group. CONCLUSIONS: There was a device but not an age-related difference in deposition. The antistatic VHC improved deposition of HFA-FP and compensated for passive inhalation in children 1-4 yr.

14 DO PEDIATRIC HEALTHCARE PROVIDERS KNOW HOW TO USE METERED DOSE INHALER PLUS SPACER DEVICES?

Iheagwara K, Sharif I, Ozuah PO.

Study Found

Prim Care Respir J. 2005 Jun;14(3):172-3. Epub 2005 Feb 19.

Synopsis

We tested whether health practitioners correctly used MDI-spacer devices. Of 122 subjects, 89% had instructed a patient on using a spacer. Whilst performance with the Aerochamber was the best, only 3% correctly demonstrated all the steps for that device.

"Results: 122 subjects participated in the study, (30 generalist attendings, 42 nurses and 50 residents). 100% of the physicians had prescribed an MDI-spacer; of these, 23% write a prescription for "spacer" without specifying a particular brand of spacer. Of those who do specify a brand, 94% prescribe the AeroChamber, 3% prescribe the Optihaler, 2% prescribe "other brands" and none prescribe the Optichamber."

15 THE EFFECT OF INHALATION TECHNIQUE, SPACER VOLUME AND TRAINING ON AEROSOL DELIVERY FROM SPACERS IN CHILDREN

Devadason SG, Walker SL, Owen J.

Study Found

Poster Presented at: International Conference of the American Thoracic Society Conference; 2005 May 23; San Diego, CA.

Synopsis

RATIONALE: Variability in the clinical use of inhaler devices is high, particularly in children. Optimisation of inhalation therapy should ensure more consistent dose delivery to the airways of young children. We assessed the effect of spacer volume, inhalation technique and training of the parent/child on drug delivery to children using pressurised inhalers. METHODS: Albuterol was delivered via large (Volumatic; VOL) and small (AeroChamber Plus*; AC+) spacers to 21 children (2-14yrs). Children ≥ 5yrs either took 5 tidal breaths, or one slow maximal inhalation with 10 sec breath-hold. Children <5yrs used tidal breathing only. Training sessions were scheduled ≥ 12wks apart. Drug delivery was assessed using a low resistance filter attached to the spacer mouthpiece. RESULTS: Mean (SD) drug delivery (% nominal dose) to children of all ages using AC+ [51.5 (14.7)%] was significantly higher (p=0.04) than using VOL [39.3 (10.1)%]. Mean (SD) drug delivery using the single maximal inhalation technique [45.4 (13.7)%] was significantly higher (p=0.01) than that using tidal breathing [32.3 (13.9)]. The improvement in delivery using the single maximal inhalation was most marked in the 5-7yr age group. Training the parent/ child to use the spacer correctly gave a small (3.9%) but significant increase (p=0.04) in drug delivery. CONCLUSIONS: AC+ (small volume) delivered more drug than VOL (large volume). This is possibly due to the more efficient construction and design of the AeroChamber Plus* as delivery is normally improved when using large volume spacers. The single maximal inhalation technique increased drug delivery to patients compared to tidal breathing. However, it is easier for children <5yrs to use the tidal breathing technique. Training of the parent/ patient resulted in a smaller than expected (albeit significant) increase in drug delivery.

16 SAFETY PROFILE OF FLUTICASONE PROPIONATE HFA IN PRE-SCHOOL AGE CHILDREN WITH ASTHMA

Qaqundah PY, Maspero J, Ceruti E, Scott CA, Clements DS, Wu W, Crim C.

Study Found

J Allergy Clin Immunol. Feb 2005;115(2):S211.

Synopsis

RATIONALE: To evaluate the safety of fluticasone propionate HFA 88mcg BID (FP) vs placebo HFA (PLA) via MDI with the AeroChamber Plus* spacer with attached facemask for 12 weeks in pre-school age children with asthma. METHODS: One to <4 year-olds with symptomatic asthma, receiving maintenance asthma medications (excluding systemic [SCS] or inhaled corticosteroids [ICS]) plus a short-acting beta-agonist (SABA) or SABA alone, were enrolled in this randomized (120 PLA: 239 FP), double-blind, parallel-group, placebo-controlled trial. Children receiving SCS within 10 weeks prior to randomization and/or ICS within 2 (low dose) or 8 (moderate-high dose) weeks prior to Screening were excluded. Safety assessments included: adverse events (AEs), clinical labs, oropharyngeal/nasal exams, asthma exacerbations, and 12-hour, overnight urinary cortisol excretion (U-Cortisol). RESULTS: No deaths or treatment-related serious AEs were reported. The percentages and types of AEs were comparable between groups. Events most commonly reported were fever (PLA=24%, FP=28%), nasopharyngitis (PLA=14%, FP=16%) and URTI (PLA=11%, FP=13%), events common in this age-group. Clinical lab results were comparable between groups. Few (PLA=0, FP=2) patients had a negative to positive shift in the oropharyngeal/nasal exam. More PLAtreated patients experienced an asthma exacerbation (11%) compared with FP-treated patients (4%). Baseline median UCortisol values were similar between groups (PLA=2.3mcg; FP=2.8mcg); and, there was little change from baseline after 12 weeks (PLA = -0.1mcg; FP= -0.4mcg). CONCLUSION: 12-week treatment with FP HFA 88mcg BID was well tolerated in 1 to <4 year-olds with asthma. The safety profile was similar to PLA and there was no evidence of adrenal suppression.

17 FLUTICASONE PROPIONATE HFA IMPROVES ASTHMA CONTROL IN PRESCHOOL AGE CHILDREN WITH ASTHMA

Sugerman RW, Teper AM, Girardi G, Scott CA, Clements DS, Wu W, Crim C.

Study Found

J Allergy Clin Immunol. Feb 2005;115(2):S4-S5.

Synopsis

RATIONALE: To evaluate the efficacy of fluticasone propionate HFA 88mcg BID (FP) vs placebo HFA (PLA) via MDI with the AeroChamber Plus* spacer with attached facemask for 12 weeks in pre-school age children with asthma. METHODS: One to <4 year-olds with ≥ 2 episodes of increased asthma symptoms requiring medical attention and pharmacotherapy ≤ 12 months prior to screening and a baseline 24-hr daily asthma symptom score (DASS; scale 0 = none to 3 = severe) of ≥ 1.1 were enrolled in this randomized (120 PLA: 239 FP), double-blind, parallel-group, placebo-controlled trial. Efficacy measures included: mean percent change from baseline to endpoint (last 28 days of treatment) in DASS (primary), mean change from baseline in nighttime asthma symptom scores over the entire treatment period (NASS), change from baseline to endpoint in daily rescue albuterol use (DRAB), and time to treatment failure (TF; i.e., time to first asthma exacerbation). RESULTS: Baseline mean DASS and NASS were comparable between groups (DASS=1.7 PLA, 1.8 FP; NASS = 1.2 PLA, 1.4 FP). At endpoint, FP-treated patients experienced a greater reduction (improvement) from baseline in DASS (54% FP, 44% PLA; p=0.036) and NASS (-0.56 FP, -0.44 PLA; p=0.049). Baseline DRAB use was comparable across groups (4 inhalations/day [IPD] PLA;5 IPD FP). DRAB decreased by 2 and 3 IPD for the PLA and FP groups, respectively, at endpoint. More PLA patients (12%) discontinued due to TF compared with FP-treated patients (5%) (p=0.034). CONCLUSION: Treatment with FP HFA 88 mcg BID for 12 weeks significantly improves asthma control in 1 to < 4 year-olds with asthma.

18 INHALATION TECHNIQUE AND VARIABLES ASSOCIATED WITH MISUSE OF CONVENTIONAL METERED-DOSE INHALERS AND NEWER DRY POWDER INHALERS IN EXPERIENCED ADULTS

Melani AS, Zanchetta D, Barbato N, Sestini P, Cinti C, Canessa PA, Aiolfi S, Neri M.

Study Found

Ann Allergy Asthma Immunol. 2004;93:439-446.

Synopsis

Background: Pressurized metered-dose inhalers (pMDIs) are often poorly used, but little information is available concerning use of the newer dry powder inhalers (DPIs). Objective: To estimate the inhalation technique and variables associated with the misuse of PMDIs and newer DPIs in clinical practice. Methods: A multicenter, observational survey was used to evaluate the inhalation technique in 1,404 experienced outpatients aged 15 to 88 years affected mostly by asthma (47%) and chronic obstructive pulmonary disease (39%). A total of 1,056 patients were using pMDIs, 190 in conjunction with a large volume spacer (LVS); regarding DPIs, 230 patients were using the Aerolizer Inhaler, 524 were using the Turbuhaler, and 475 were using the Diskus. In each center, a trained observer recorded patients' inhalation techniques for each inhaler used against a standardized step-by-step checklist. Results: Twenty-four percent and 3% of patients used pMDIs poorly, alone or with an add-on LVS, respectively. Failure to correctly perform essential steps for reliable lung delivery with the Aerolizer Inhaler, Turbuhaler, and Diskus was found in 17%, 23%, and 24% of patients, respectively. There was no difference in most variables correlated with poor inhalation between patients using pMDIs and those using DPIs. Conclusions: The use of DPIs is associated with a similar percentage of inadequate inhalation technique as the use of pMDIs in clinical practice. The addition of an LVS to a pMDI and education form health care personnel, rather than simply changing inhalers, represent the best strategies for minimizing poor inhalation technique.

19 IMPACT OF A NEW ANTI-STATIC VALVED HOLDING CHAMBER ON AIRWAY DELIVERY OF INHALED FLUTICASONE PROPIONATE IN ASTHMATIC CHILDREN

Asmus MJ, Hochhaus G, Tang Y, Spencer LT, Sturtz P, Hendeles L.

Study Found

Poster Presented at: International Conference of the American Thoracic Society; 2004 May 22; Orlando, FL.
Am J of Resp and Crit Care Med. 2004 April;169(7):A150.

Synopsis

The only effective way to administer fluticasone propionate (FP) to young asthmatic children in the United States is via metered-dose inhaler (MDI) attached to a valved holding chamber (VHC) with mask. Using this method, several factors potentially influence the amount of FP delivered to the patient's airways, including electrostatic charge on the VHC. Since FP peak plasma concentrations are directly proportional to inhaled dose, we used the 1-hour post-dose FP plasma concentration to estimate relative airway delivery in young children from a MDI attached to a conventional VHC with mask, and a new VHC with mask made from electrostatic charge resistant plastic. FP plasma concentrations were determined in 12 children (1.3-6.8 yr) with adequately controlled persistent asthma 1-hour after inhaling 2x110 µg/puffs of FP MDI with HFA-134a propellant BID for at least 3 days through a conventional VHC with mask (AeroChamber Plus*, Monaghan) and the new anti-static VHC with mask (AeroChamber MAX*, Trudell) in a randomized crossover fashion. An electronic monitor confirmed perfect adherence. Subjects and parents were trained to adequately use each device. FP plasma concentrations were quantified by a novel LC-MS/MS assay. A paired student t test was used to compare observed differences in the mean 1-hour FP plasma concentration after each device. Mean ±SD 1-hour FP plasma concentration was 185.6±134.2 pg/ml from the new anti-static VHC with mask, and 106.9±29.5 pg/ml from the conventional VHC with mask (p=0.035). The new anti-static VHC with mask improved delivery of FP to the airways by 70% in young children. FP concentrations after the anti-static VHC were in the same range as those measured in a previous study of older children (6-9 yr) using InspirEase with more efficient inhalation technique.

20 EQUIVALENT PHARMACOKINETICS OF THE ACTIVE METABOLITE OF CICLESONIDE WITH AND WITHOUT USE OF THE AEROCHAMBER PLUS* SPACER FOR INHALATION

Drollmann A, Nave R, Steinijans VW, Baumgärtner E and Bethke TD.

Study Found

J Allergy and Clin Imm. 2004 Feb;113(2):S120.

Synopsis

Background: Ciclesonide is an inhaled corticosteroid that provides safe and effective control of patient asthma. Ciclesonide is administered as an aerosol solution in a metered-dose inhaler, using hydrofluoroalkane-134a as a propellant. It is activated in the lung to form its onlyactive metabolite, desisobutyryl-ciclesonide (des-CIC). A spacer may be used in combination with the hydrofluoroalkane metered-dose inhaler (HFA-MDI) to maintain inhaled corticosteroid delivery to the lung in patients with poor inhalation technique. Objective: To determine if the pharmacokinetics of des-CIC and ciclesonide are altered when a spacer is used for ciclesonide inhalation. Methods: A randomized, open-label, 2-period crossover, single-center pharmacokinetic study was conducted in 30 patients with asthma (forced expiratory volume in 1 second ≥ 70% predicted). A single dose of ciclesonide (320 µg ex-actuator; equivalent to 400 µg ex-valve) was administered via the HFA-MDI with and without an AeroChamber Plus* spacer (Trudell Medical International, London, ON, Canada). Serum concentrations of ciclesonide and des-CIC were measured before inhalation and at various intervals until 14 hours after treatment using high-performance liquid chromatography with tandem mass spectrometric detection. Results: The pharmacokinetic properties of the active metabolite, des-CIC, were equivalent after inhalation of ciclesonide with and without the AeroChamber Plus* spacer. Point estimates and 90% confidence intervals (CIs) for the ratio of des-CIC pharmacokinetic properties in the presence or absence of a spacer were within the conventional bioequivalence range of 0.80-1.25 (area under the serum concentration time curve from time zero to infinity 0.96 [0.85, 1.07]; peak serum concentration 1.05 [0.94, 1.18]; elimination half-life 1.04 [0.92, 1.18]). Furthermore, there was no relevant difference in the point estimate and 90% CI of the difference of the time to reach peak serum concentration of des-CIC with or without a spacer. Conclusion: The AeroChamber Plus* spacer did not influence the pharmacokinetics of the pharmacologically active des-CIC. Thus, systemic exposure to the active metabolite is similar when ciclesonide is inhaled with or without a spacer.

21 A COMPARISON OF THE BRONCHOPROTECTIVE EFFECT OF CFC AND HFA ALBUTEROL METERED-DOSE INHALERS (NDIS) USED IN COMBINATION WITH THE AEROCHAMBER PLUS*

Ahrens RC., Teresi ME., Lux CR., Tan Y.

Study Found

Poster Presented at: International Conference of the American Thoracic Society ; 2003 May 17; Seattle, WA.

Synopsis

Previous studies have documented equivalent clinical efficacy of directly inhaled CFC and HFA albuterol MDIs but not whether use of a holding chamber alters this relationship. We compared albuterol delivery to the lungs by an HFA MDI with that of a CFC MDI when used in combination with an AeroChamber Plus* valved-holding chamber (VHC) using a methacholine challenge based bioassay. Seventeen subjects completed this double-blind, randomized, balanced cross-over study. Treatments were 1 or 2 actuations of albuterol CFC MDI (90mcg/puff) or HFA MDI (100 mcg/puff). One of 4 treatments was administered during each study period with the AeroChamber Plus* VHC. A methacholine challenge (modified Juniper method) was initiated 15 minutes after albuterol administration. Results: (geometric mean PC20FEV1) (we will recreate the proper chart to show these results in final version)

1 Puff CFC	2 Puffs CFC	1 Puff HFA	2 Puffs HFA
16.96	18.81	15.06	20.79

The dose-response relationship was significant (p=0.034) and parallelism and preparation contrasts were not significant (p=0.93, 0.27, respectively). The relative potency estimated using Finney 2-by-2 bioassay statistics was 0.97 (90% confidence interval [CI] 0.41-2.14). The 90% bias-corrected and accelerated percentile bootstrap CI for this estimate was 0.58-1.75. Removing an outlier from the data, the estimated relative potency was 1.04 (90% CI 0.65-1.73). Conclusion: HFA-and CFCMDIs deliver equivalent quantities of albuterol to the lung when used with the AeroChamber Plus* VHC.

22 NEBULIZERS VS METERED-DOSE INHALERS WITH SPACERS FOR BRONCHODILATOR THERAPY TO TREAT WHEEZING IN CHILDREN AGED 2 TO 24 MONTHS IN A PEDIATRIC EMERGENCY DEPARTMENT

Delgado A, Chou KJ, Johnson Silver E, Crain EF.

Study Found

Arch Pediatr Adolesc Med. 2003;157:76-80.

Synopsis

OBJECTIVE: To determine if administration of albuterol by a metered-dose inhaler with a spacer device (AeroChamber*) is as efficacious as administration of albuterol by nebulizer to treat wheezing in children aged 2 years and younger. DESIGN: Double-blind, randomized, placebo-controlled clinical trial. SETTING: Pediatric emergency department. PATIENTS: From a convenience sample of wheezing children aged 2 to 24 months, 85 patients were enrolled in the nebulizer group and 83 in the spacer group. INTERVENTIONS: The nebulizer group received a placebo metered-dose inhaler with a spacer followed by nebulized albuterol. The spacer group received albuterol by a metered dose inhaler with a spacer followed by nebulized isotonic sodium chloride solution. Treatments were given every 20 minutes by a single investigator blinded to group assignment. MAIN OUTCOME MEASURES: The primary outcome was admission rate. Pulmonary Index score and oxygen saturation were measured initially and 10 minutes after each treatment. RESULTS: The nebulizer group had a significantly higher mean (SD) initial Pulmonary Index score compared with the spacer group (7.6 [2.5] vs 6.6 [2.0]; P =.002). With the initial Pulmonary Index score controlled, children in the spacer group were admitted less (5% vs 20%; P =.05). Analyses also revealed an interaction between group and initial Pulmonary Index score; lower admission rates in the spacer group were found primarily in children having a more severe asthma exacerbation. CONCLUSION: Our data suggest that metered-dose inhalers with spacers may be as efficacious as nebulizers for the emergency department treatment of wheezing in children aged 2 years or younger.

23 A COMPARISON OF ALBUTEROL ADMINISTERED BY METERED-DOSE INHALER AND SPACER WITH ALBUTEROL BY NEBULIZER IN ADULTS PRESENTING TO AN URBAN EMERGENCY DEPARTMENT WITH ACUTE ASTHMA

Newman KB, Milne S, Hamilton C, Hall K.

Study Found

Chest. 2002 April;121:1036-1041.

Synopsis

STUDY OBJECTIVES: To determine the efficacy of albuterol by metered-dose inhaler (MDI) and spacer (AeroChamber*) compared to a nebulizer. DESIGN: Aprospective, open-label study. SETTING: Large urban emergency department (ED). PATIENTS: All consecutive adult asthma patients over a 2.5-year period. INTERVENTIONS: ED personnel used a standardized treatment algorithm, which included albuterol administered by nebulization, for patients presenting to the ED during the first 12 months of the study. The treatment algorithm then was switched to one that utilized albuterol administered by MDI/spacer as the primary mode of delivery for the following 18 months. As part of the conversion to MDI/spacer, ED staff counseled patients on self management and supplied patients with a peak flowmeter, an MDI/spacer, and an inhaled steroid for home use. MEASUREMENTS: Pulmonary function, clinical outcome, laboratory data, and financial data were assembled and analyzed from 2,342 ED visits and 1,420 patients. RESULTS: While there was no significant difference in hospital admission rates between patients in the MDI/spacer group and the nebulizer group (13.2% and 14.6%, respectively), there was a statistically greater improvement in peak flow rates in the MDI/spacer group (126.8 vs 111.9 L/min, respectively; $p = 0.002$). The MDI/spacer group also spent significantly less time in the ED (163.6 and 175 min, respectively; $p = 0.007$), had a lower total albuterol dose (1,125 microg and 6,700 microg, respectively; $p < 0.001$), and showed a greater improvement in arterial oxygen saturation ($p = 0.043$). Relapse rates at 14 and 21 days were significantly lower ($p < 0.01$ and $p < 0.05$, respectively) among patients treated with the MDI/spacer and were associated with asthma education and the provision of a peak flowmeter, a spacer, and an inhaled corticosteroid for patients' home use. CONCLUSIONS: Albuterol administered by MDI/spacer is an efficacious and costeffective alternative to nebulization in adults with acute asthma who present at a large urban ED.

24 MISUSE OF CORTICOSTEROID METERED-DOSE INHALER IS ASSOCIATED WITH DECREASED ASTHMA STABILITY

Giraud V, Roche N.

Study Found

Eur Resp J. 2002;19:246-251.

Synopsis

ABSTRACT: This study assessed whether the improper use of pressurized metered dose inhalers (pMDIs) is associated with decreased asthma control in asthmatics treated by inhaled corticosteroids (ICS). General practitioners (GPs) included consecutive asthmatic outpatients treated by pMDI-administered ICS and on-demand, short-acting β2-agonists. They measured an asthma instability score (AIS) based on daytime and nocturnal symptoms, exercise induced dyspnea, β2-agonist usage, emergency-care visits and global perception of asthma control within the preceding month; the inhalation technique of the patient also was assessed. GPs (n=915) included 4,078 adult asthmatics; 3,955 questionnaires were evaluable. pMDI was misused by 71% of patients, of which 47% was due to poor coordination. Asthma was less stable in pMDI misusers than in good users (AIS: 3.93 versus 2.86, $p<0.001$). Among misusers, asthma was less stable in poor coordinators (AIS: 4.38 versus 3.56 in good coordinators, $p<0.001$). To conclude, misuse of pressurized metered-dose inhalers, which is mainly due to poor coordination, is frequent and associated with poorer asthma control in inhaled corticosteroid-treated asthmatics. This study highlights the importance of evaluating inhalation technique and providing appropriate education in all patients, especially before increasing inhaled corticosteroid dosage or adding other agents. The use of devices which alleviate coordination problems should be reinforced in pressurized metered-dose inhaler misusers.

25 THE DELIVERY TIME, EFFICACY AND SAFETY OF BETA AGONIST BRONCHODILATOR ADMINISTRATION WITH THE AEROECLIPSE® BREATH ACTUATED NEBULIZER (BAN)

Pikarsky RS, Farrell T, Acevedo R, Fascia W, Roman C.

Study Found

Poster Presented at: The American College of Chest Physicians (ACCP); 2001 November 4-8; Philadelphia, PA.

Synopsis

PURPOSE: Aerosol delivery consumes the highest level of Respiratory Care resources. This study evaluated the delivery time, efficacy, and safety of rapidly nebulized Albuterol with the use of the AeroEclipse® Breath Actuated Nebulizer as compared to both an MDI with AeroChamber® VHC (both from Monaghan Medical Corp., Plattsburgh, N.Y.) and the Airlife Misty-Neb Nebulizer (SVN) (Allegiance Healthcare Corporation). Methods: A consecutive, non-randomized, mostly COPD population receiving pre & post bronchodilator testing in our Pulmonary Function Lab were studied. Three different Albuterol medication dosages were administered with the BAN: 0.5 ml Albuterol (2.5 mg) with 0.5 ml Normal Saline, 1.0 ml (5mg) of undiluted Albuterol, and 0.75 ml Albuterol (3.75 mg) using an oxygen flow rate of 8 L/min. Two puffs of Albuterol were administered by MDI with AeroChamber® VHC. Treatments with the SVN consisted of nebulizing 2.5 mg of Albuterol diluted with 3 ml of Normal Saline Unit Dose (UD) using an oxygen flow rate of 8 L/min. The Sensormedics Vmax 22 Pulmonary Function System was utilized to measure FEV1. A standardized subjective questionnaire to determine side effects was completed. Results: The table shows the Albuterol dosages, mean % change of FEV1 from pre-treatment and 10 minute post treatment, mean administration time and tremulousness. The mean treatment time with all BAN patients was 2.78 minutes as compared to 8.33 minutes with SVN ($p<.001$)*. The mean treatment time with the MDI was 2.86 minutes as compared to 8.33 minutes with the SVN ($p<.001$)**. The changes in FEV1 were not significant. There was no difference in heart rate, respiratory rate or nausea. Seventeen patients receiving the 1.01 undiluted Albuterol indicated an increase in tremulousness.

Nebulizer (n)	Dose	% Change FEV1	Time (min)	Tremulousness
AeroEclipse™BAN (12)	0.5ml +0.5ml NS	8.20%	2.67*	0
AeroEclipse™BAN (64)	1.0 ml undil.	10.90%	3.29*	17
AeroEclipse™BAN (23)	0.75ml undil.	5.60%	1.30*	5
MDI (21)	2 puffs	8.50%	2.86**	1
Misty-Neb (52)	2.5mg UD	9.10%	8.33	2

Conclusion: The rapid administration of Albuterol in the 0.5 ml + 0.5 ml NS and 1.0 ml undiluted doses using the BAN was equally efficacious as the MDI with AeroChamber® VHC and SVN UD. The 1.0 ml Albuterol dosage has the highest incidence of tremulousness. The 0.75 ml Albuterol dosage under-performed. Delivering 0.5 ml Albuterol (2.5 mg) with 0.5 ml Normal Saline using the BAN offered the best delivery time, efficacy and safety profile of the nebulizer trials. The BAN performance was comparable to the MDI with AeroChamber® VHC. Clinical Implications: In a health care facility that delivers large volumes of aerosol treatments, the decrease in delivery time could have a significant impact on resource utilization. The results supported changes in the Respiratory Care practice throughout Crouse Hospital. Further studies evaluating additional medication dosing regimens measuring safety, efficacy and resource utilization are needed.

26 AEROSOL THERAPY WITH VALVED HOLDING CHAMBERS IN YOUNG CHILDREN: IMPORTANCE OF THE FACEMASK SEAL

Amirav I, Newhouse MT.

Study Found

Pediatrics. 2001 Aug;108:389-94.

Synopsis

OBJECTIVE: Masks are an essential interface between valved holding chambers (VHCs), or spacers, and a small child's face for providing aerosol therapy. Clinical experience suggests that many young children do not cooperate with the VHC treatment or tolerate a mask of any kind. This might impair the mask-face seal and reduce the dose delivered to the child. The objective of this study was to evaluate the ability of parents to provide a good mask-face seal in infants and toddlers using 3 masks provided with commonly used pediatric VHCs and compare this with the seal obtained with the Hans Rudolph pediatric anesthesia mask. METHODS: A preliminary in vitro filter study was conducted to validate the assumption that reduced 9 ventilation as a result of increased facemask leak reduces the drug aerosol dose delivered to the mouth. Facemask leak then was studied in vivo for NebuChamber, AeroChamber, BabyHaler, and Hans Rudolph masks by measuring ventilation with an in-line pneumotachograph while the facemask was held in place by experienced parents who were asked to demonstrate how they deliver medication to their children without any additional instruction. Thirty children (mean age: 3.2 +/- 1.4 years) performed 4 repeat studies with each mask. The first 10 patients performed the tests once again within 1 month. On the second occasion, the parents were coached continuously and encouraged to hold the mask tightly against the child's face. RESULTS: The AeroChamber and Hans Rudolph masks provided the best seal as reflected in the magnitude of the ventilation measured through them. The NebuChamber provided the poorest seal, with 45% less ventilation than the AeroChamber and Hans Rudolph masks. There was considerable intraindividual variability for all masks (24% to 48%); however, the variability with the NebuChamber mask was 2-fold greater than the other masks. All ventilatory volumes during the coached session were significantly greater than during the uncoached session. Variability during the coached session was significantly less (except for the BabyHaler, which remained unchanged). CONCLUSIONS: VHCs with masks designed for use with small children may provide a poor seal with the face, leading to reduced or more variable dose delivery. The facemask seal is critical for efficient aerosol delivery to infants and young children, and this should be stressed to parents.

27 COSTS AND EFFECTIVENESS OF SPACER VERSUS NEBULIZER IN YOUNG CHILDREN WITH MODERATE AND SEVERE ACUTE ASTHMA

Leversha AM, Campanella SG, Aickin RP, Asher MI.

Study Found

J. Pediatr. 2000 Apr;136(4):497-502.

Synopsis

OBJECTIVE: To compare the costs and effectiveness of albuterol by metered dose inhaler (MDI) and spacer versus nebulizer in young children with moderate and severe acute asthma. DESIGN: Randomized, double-blind, placebocontrolled trial in an emergency department at a children's hospital. The participants were children 1 to 4 years of age with moderate to severe acute asthma. Patients assigned to the spacer group received albuterol (600 microg) by MDI by spacer (AeroChamber*) followed by placebo by nebulizer (n = 30). The nebulizer group received placebo MDI by spacer followed by 2.5 mg albuterol by nebulizer (n = 30). Treatments were repeated at 20-minute intervals until the patient was judged to need no further doses of bronchodilator, or a total of 6 treatments. RESULTS: Clinical score, heart rate, respiratory rate, auscultatory findings, and oxygen saturation were recorded at baseline, after each treatment, and 60 minutes after the last treatment. Baseline characteristics and asthma severity were similar for the treatment groups. The spacer was as effective as the nebulizer for clinical score, respiratory rate, and oxygen saturation but produced a greater reduction in wheezing (p =0.03). Heart rate increased to a greater degree in the nebulizer group (11.0/min vs 0.17/min for spacer, p <0.01). Fewer children in the spacer group required admission (33% vs 60% in the nebulizer group, p =0.04, adjusted for sex). No differences were seen in rates of tremor or hyperactivity. The mean cost of each emergency department presentation was NZ$825 for the spacer group and NZ$1282 for the nebulizer group (p =0.03); 86% of children and 85% of parents preferred the spacer. CONCLUSION: The MDI and spacer combination was a cost-effective alternative to a nebulizer in the delivery of albuterol to young children with moderate and severe acute asthma.

28 EFFECTS OF SALBUTAMOL DELIVERY FROM A METERED DOSE INHALER VERSUS JET NEBULIZER ON DYNAMIC LUNG MECHANICS IN VERY PRETERM INFANTS WITH CHRONIC LUNG DISEASE

Gappa M, Gartner M, Poets CF, von der Hardt H.

Study Found

Pediatr Pulmonol. 1997 Jun;23(6):442-8.

Synopsis

Treatment of chronic lung disease of prematurity requires effective aerosol delivery of different therapeutic agents. Aerosols can be generated by a metered dose inhaler (MDI) or a jet nebulizer. An MDI combined with a spacer device is easier to use and avoids undesirable effects noted in conjunction with jet nebulization. We compared the clinical effectiveness of 200 micrograms (2 puffs) salbutamol delivered from an MDI in conjunction with a valved spacer device (AeroChamber*), and 600 micrograms given via jet nebulizer (PariBaby) on 2 consecutive days, the order being randomized. Thirteen spontaneously breathing very pre-term infants [mean (SD) gestational age 27.2 (1.8) weeks; birth weight 0.90 (0.34) kg] were studied at a corrected age of 37 (2.3) weeks. Mean (SD) study weight was 1.83 (0.38) kg. Dynamic lung compliance and resistance were determined from measurements of flows, volumes, and transpulmonary pressures, using a pneumotachometer and a small esophageal microtransducer catheter before and 20 min after salbutamol application. Baseline values before salbutamol administration were similar on both occasions: the mean (SD) compliance was 7.7 (3.0) mL.kPa-1.kg-1 pre-MDI plus-spacer and 8.4 (3.1) pre-jet nebulizer; the resistance was 10.4 (4.0) kPa.L-1.s pre-MDI plus-spacer and 9.7 (3.4) pre-jet nebulizer. Following salbutamol, compliance did not change significantly with either MDI plus spacer or jet nebulizer. Resistance fall significantly with MDI plus spacer (mean -2.2; 99.9% CI -0.35, -4.35) and jet nebulizer (-2.4; 99% CI -0.39, -4.42). We conclude that even in small pre-term infants 200 micrograms salbutamol via MDI plus spacer improves dynamic resistance as effectively as 600 micrograms via jet nebulizer and may therefore be a preferable mode of aerosol administration.

29 METERED-DOSE INHALATIONS WITH SPACERS VS. NEBULIZERS FOR PEDIATRIC ASTHMA

Chou KJ, Cunningham SJ, Crain EF.

Study Found

Arch Pediatr Adolesc Med. 1995;149:201-5.

Synopsis

OBJECTIVE: To determine whether the administration of ß-agonists by metered-dose inhaler (MDI) with a spacer device is as effective as the administration of ß-agonists by nebulizer for the treatment of acute asthma exacerbations in children. Design: Randomized trial with two arms. Setting: Urban pediatric emergency department (ED) in Bronx, NY. Patients: Convenience sample of 152 children 2 years and older with a history of at least two episodes of wheezing presenting to the ED with an acute asthma exacerbation. Interventions: Patients were randomly assigned to receive standard doses of an ß-agonists (albuterol) by an MDI with spacer (AeroChamber*) or by a nebulizer. Dosing intervals and the use of other medications were determined by the treating physician. Measurements/ Main Results: Baseline characteristics and asthma history were recorded. Asthma severity score, peak expiratory flow rate in children 5 years or older, and oxygen saturation were determined at presentation and before admission or discharge. The groups did not differ in age, sex, ethnicity, age of onset of asthma, or asthma severity score, and peak expiratory flow rate, oxygen saturation, number of treatments given, admission rate. Patients given MDIs with spacers required shorter treatment times in the ED (66 minutes vs. 103 minutes, $p<0.001$). Fewer patients in the spacer group had episodes of vomiting in the ED (9% vs. 20%, $p<0.04$), and patients in the nebulizer group had a significantly greater mean percent increase in heart rate from baseline to final disposition (15% vs. 5%, $p<0.001$). Conclusions: These data suggest that MDIs with spacers may be an effective alternative to nebulizers for the treatment of children with acute asthma exacerbations in the ED.

Response to Albuterol MDI Delivered Through an Anti-Static Chamber During Nocturnal Bronchospasm

Sreekala Prabhakaran MD, Jonathan Shuster PhD,
Sarah Chesrown MD PhD, and Leslie Hendeles PharmD

BACKGROUND: Decreasing electrostatic charge on valved holding chambers increases the amount of drug delivered. However, there are no data demonstrating that this increases bronchodilatation. OBJECTIVE: To investigate the influence of reducing electrostatic charge on the bronchodilator response to albuterol inhaler during nocturnal bronchospasm. METHODS: This randomized double-blind, double-dummy crossover study included subjects, 18–40 years old, with nocturnal bronchospasm (20% overnight decrease in peak flow on 3 of 7 nights during run-in), FEV_1 60–80% predicted during the day, and ≥ 12% increase after albuterol. Subjects slept in the clinical research center up to 3 nights for each treatment. FEV_1 and heart rate were measured upon awakening spontaneously or at 4:00 AM, and 15 min after each dose of 1, 2, and 4 cumulative puffs of albuterol via metered-dose inhaler. The drug was administered through an anti-static valved holding chamber (AeroChamber Plus Z-Stat) or a conventional valved holding chamber containing a static charge (AeroChamber Plus). RESULTS: Of 88 consented subjects, 11 were randomized and 7 completed the study. Most exclusions were due to lack of objective evidence of nocturnal bronchospasm. Upon awakening, FEV_1 was 44 ± 9% of predicted before the anti-static chamber and 48 ± 7% of predicted before the static chamber. The mean ± SD percent increase in FEV_1 after 1, 2, and 4 cumulative puffs using the anti-static versus the static chamber, respectively, were 52 ± 26% versus 30 ± 19%, 73 ± 28% versus 48 ± 26%, and 90 ± 34% versus 64 ± 35%. The point estimates for the differences (and 95% CIs) between the devices (anti-static vs static) were 21% (4–38%) (P = .03), 23% (6–41%) (P = .02), and 25% (7–42%) (P = .01) for 1, 2, and 4 cumulative puffs, respectively. There was no significant difference in heart rate between treatments. CONCLUSIONS: Delivery of albuterol through an anti-static chamber provides a clinically relevant improvement in bronchodilator response during acute, reversible bronchospasm such as nocturnal bronchospasm. *Key words: albuterol; anti-static; valved holding chamber; nocturnal bronchospasm.* [Respir Care 2012;57(8):1291–1296. © 2012 Daedalus Enterprises]

Introduction

Efficient delivery of inhaled medications from a metered-dose inhaler (MDI) requires optimal inhalation technique. However, many patients have difficulty coordinating actuation and inhalation from an MDI, which impairs drug delivery.[1] This problem can be solved with the use of a valved holding chamber (VHC) with mouth piece, or

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Dr Hendeles presented a version of this paper at the annual meeting of the American Academy of Allergy, Asthma, and Immunology, held March 19, 2011, in San Francisco, California.

The authors have disclosed relationships with Monaghan Medical and Schering-Plough. This research was partly supported by a grant from the Children's Miracle Network at the University of Florida; by fellowship training grant T72MC000002 from the Maternal and Child Health Bureau, United States Department of Health and Human Resources; by grant 1UL1RR029890 from the National Center for Research Resources, National Institutes of Health; and by grant RR17568 from the Research Facilities Construction Program, National Institute of Health.

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DOI: 10.4187/respcare.01572

with an attached mask for children and the elderly. A VHC holds the aerosol in a reservoir prior to inhalation, thereby reducing oropharyngeal deposition and increasing lung deposition.[2] Larger particles are retained in the VHC, thus allowing smaller particles to be inhaled.[3]

The electrostatic charge (ESC) on the inner walls of conventional chambers attracts aerosol particles and markedly reduces the respirable dose.[4] This, in turn, reduces the amount of drug delivered to the airways. In contrast, VHCs made from electrically conductive materials emit a significantly larger respirable dose than those made from nonconducting materials, even with wash/rinse pretreatment.[5]

An early in vivo study in children, using plasma concentrations as an indirect measure of the amount of albuterol delivered to the airways by MDI containing a hydrofluoroalkane (HFA) propellant, demonstrated that reducing the ESC on plastic chambers increased lung dose by more than 2-fold.[6]

In contrast, Dompling et al were unable to demonstrate a significant improvement in peak expiratory flow from albuterol MDI containing a chlorofluorocarbon (CFC) propellant, after reducing ESC in VHC with an ionic detergent.[7] However, the mean peak expiratory flow in these subjects was 91% predicted, so response was at the upper flat portion of the dose-response curve. Under these circumstances it is not possible to detect a difference in the amount of drug delivered to the airways by measurement of pulmonary function.[8] In contrast, during nocturnal bronchospasm (drop in FEV_1 during the night to $< 60\%$ predicted), the dose-response curve is shifted to the right and much steeper than during the day in the same subjects when asymptomatic.[9] Consequently, determining bronchodilator response during nocturnal bronchospasm provides a clinically relevant method of comparing differences between delivery devices of the same drug or between different β agonists.[10]

There are no data on the clinical relevance of reducing the ESC in patients with acute bronchospasm. Since HFA albuterol may have a greater dose charge than CFC albuterol,[11] reducing the ESC may have a greater effect than with the former CFC albuterol inhalers. Thus, the purpose of this study was to investigate the influence of reducing ESC on the bronchodilating response to HFA albuterol, using nocturnal asthma as a clinical model of acute bronchospasm. It was our hypothesis that the anti-static chamber would increase bronchodilator response.

QUICK LOOK

Current knowledge

Decreasing the electrostatic charge inside a valved-holding chamber increases the amount of aerosolized drug delivered, but no data demonstrate that this increases the degree of bronchodilatation or dyspnea relief.

What this paper contributes to our knowledge

Delivery of albuterol through an anti-static chamber, compared to a static chamber, provided a clinically relevant improvement in bronchodilator response during acute, reversible bronchospasm such as nocturnal bronchospasm.

Methods

The study was approved by the University of Florida institutional review board (103–2008), and all subjects gave written informed consent. Eleven subjects, 18–40 years old, with documentation of nocturnal asthma were randomized. None of the randomized subjects were on any asthma maintenance medications. At the screening visit, subjects had a baseline FEV_1 of 60–80% predicted during the day and a bronchodilator response of $\geq$ 12% and to at least 80% predicted after 2–4 puffs of albuterol HFA MDI delivered by anti-static VHC (Table 1). They had to be nonsmokers for at least 1 year and have a smoking history of not more than 10 pack-years. Women of childbearing age had a negative pregnancy test and used a reliable method of contraception, if sexually active. They were able to perform acceptable and reproducible spirometry according to American Thoracic Society/European Respiratory Society standards for lung function testing.[12] Subjects were excluded if they had a severe asthma exacerbation requiring hospitalization in the past 12 months, if they required a short course of systemic corticosteroids in the past 30 days, or if they had a viral respiratory infection in the past 3 weeks or during the study.

Study Design

This was a randomized, double-blind, double dummy, single center, crossover study comparing the bronchodilator response to HFA albuterol MDI delivered through anti-static and static chambers during nocturnal bronchospasm. The first visit was the screening visit. A physical exam, complete blood count, basic metabolic panel, and urinalysis were performed. Then the subjects entered a 7-day run in period where they measured peak expiratory flow twice daily and recorded asthma symptoms and albuterol use in an asthma diary. In order to qualify for the study they had to have a 20% overnight drop in the peak expiratory flow on 3 out of 7 nights.

After meeting the selection criteria, the subjects slept in the clinical research center up to 3 nights for each treatment, until they woke up spontaneously or had bronchospasm when awakened at 4:00 AM. Baseline FEV_1 and vital

Table 1. Demographics and Bronchodilator Response During Screening Visit of Subjects Who Completed the Study

Subject Number	Age, y	Sex	Baseline FEV_1, L	Baseline FEV_1, % predicted	Bronchodilator Response, % increase*
18	40	F	1.88	63	41
20	25	F	2.04	76	29
35	18	F	2.37	73	19
36	27	M	2.72	65	39
37	21	M	3.20	62	28
56	21	M	3.86	79	19
87	22	F	2.16	75	21
Mean ± SD	25 ± 7		2.60 ± 0.71	70 ± 7	28 ± 9

* After 2–4 puffs of albuterol from a metered-dose inhaler delivered through an anti-static chamber.

signs were performed on admission before 10:00 PM. If subjects did not wake up spontaneously before 4:00 AM, they were awoken by the clinical research center staff at 4:00 AM. Upon awakening, spirometry and heart rate were measured, and the study proceeded if the FEV_1 was ≤ 60% predicted (ie, nocturnal bronchospasm). Subjects then inhaled one actuation from an MDI containing albuterol attached to one of the VHCs, followed by another actuation from an MDI containing placebo attached to the other VHC. This process was repeated with 1 and 2 actuations with both chambers, at 20 min intervals, providing cumulative doses of 1, 2, and 4 actuations. There was no delay between releasing the drug dose into the VHC and inhaling. Spirometry and heart rate were repeated 15 min after the last actuation of each dose. The second treatment was identical to the first night, except albuterol was delivered through the opposite active VHC and placebo through the other VHC. Subjects were studied only once on each treatment.

Study Drug

The drug product used was Proventil MDI, 90 μg/puff, while the placebo contained HFA propellant alone, both manufactured by Schering-Plough, Kenilworth, New Jersey. The labels on each canister were covered with an opaque white gummed label. MDIs were primed with several puffs before administration to the subject.

Devices

AeroChamber Z-Stat Plus was used as the anti-static chamber, and AeroChamber-Plus as the conventional static chamber (both marketed in the United States by Monaghan Medical, Plattsburgh, New York). Each subject used a different set of chambers for each treatment. Blinding of MDI and VHC was performed by an investigator not involved in data collection during clinical research center visits (LH).

Electrostatic Charge

ESC was measured, in duplicate, for each chamber, after removal from the plastic wrapper, with an electrostatic charge meter with a Faraday bucket (NanoCoulomb Meter 284, Monroe Electronics, Lyndonville, New York), which is a battery powered, portable instrument for direct measurement of ESC. The instrument was zeroed and then the chamber was placed in the Faraday bucket and the reading recorded. The anti-static device used for each subject had to have < 2.5 volts, while the static device had to have > 12 volts. Interestingly, several static chambers did not have a sufficient ESC and were discarded.

Spirometry

Spirometry was performed with a calibrated pneumotachometer spirometer (KoKo, Quantum Research, Louisville, Colorado). All FEV_1 measurements were performed in duplicate. A third measurement was not planned, since we expected subjects to have moderate to severe airway obstruction and to be in acute distress, requiring albuterol for relief. The clinical research center nurses were trained to perform spirometry. The software was set to utilize the reference equations for predicted values from Hankinson et al.[13]

Statistical Methods

Sample Size Calculation. The study was designed to have at least 80% power at $P = .0167$ (0.05/3 puff variables) two-sided, to detect a difference of 9.4% in FEV percentages, based on a sample size of 5 per ordering. The actual sensitivity based on a retrospective power calcula-

tion for $n = 7$, was about a 12% difference. There was no bias, since the decision to terminate the study after 7 completed subjects was made while the data were blinded. This decision was based on the inability to recruit more subjects during the time available to the pulmonary fellow to complete the study.

Randomization. SAS Proc Plan was used to randomize the subjects, and a pharmacist co-investigator (LH) blinded the inhalers and dispensed medication to the clinical research center.

Data Analysis. The primary variable for bronchodilator response was the FEV_1. Values for measurements obtained after dosing were expressed as a percent increase from FEV_1 upon awakening as follows:

$$[(\text{Post-dose } FEV_1 - FEV_1 \text{ upon awakening}) \times 100]/ FEV_1 \text{ upon awakening}$$

The 2-sample method for inference in crossover studies was used, where the period 2 minus period 1 outcomes were obtained independent of treatment ordering, and the orderings compared. Compared to one sample methods that ignore treatment order, this is more robust against bias when the number of subjects assigned to the 2 treatments differs, or where there is a period effect. A univariate analyses was performed on percentage increase in FEV_1 at 1, 2, and 4 puffs, while the overall 8-sided bronchodilator response was determined by the Hotelling T^2 multivariate analysis.[14] Heart rate was compared in a similar manner.

Results

A total of 88 subjects signed the informed consent, but only 11 subjects were randomized (Fig. 1). Most exclusions were due to lack of objective evidence of nocturnal bronchospasm either during the screening visit or during the run-in. Seven subjects completed the study (Table 2). Four subjects did not have nocturnal bronchospasm in the clinical research center. All 7 subjects who completed the study were taking only a short-acting bronchodilator as needed prior to the study.

Upon admission to the clinical research center before 10 PM, the evening FEV_1 was 62.7 ± 15% predicted on the night that they received active drug through the anti-static chamber, and 64 ± 8.6% when they received albuterol through the static chamber. Upon awakening, the FEV_1 was precipitously lower than the admission values: 44 ± 9% predicted before delivery of albuterol through the anti-static chamber, and 48 ± 7% predicted before delivery of active drug through the static chamber.

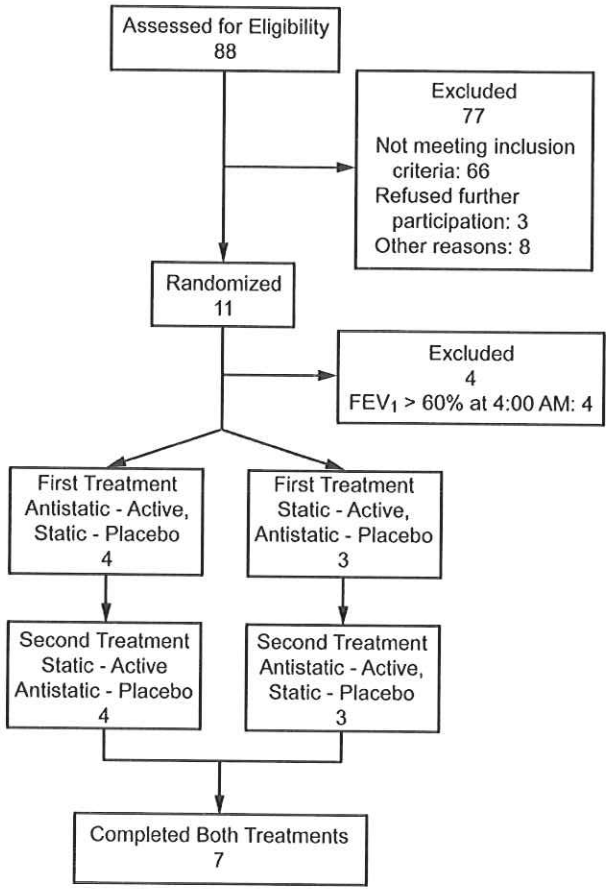

Fig. 1. Consort diagram of subject disposition.

The mean ± SD percent increase in FEV_1 after 1, 2, and 4 cumulative puffs using anti-static versus static chambers, respectively, were 52 ± 26% versus 30 ± 19% , 73 ± 28% versus 48 ± 26% and 90 ± 34% versus 64 ± 35% (Fig. 2, Table 2). The point estimates (and 95% CIs) for the difference between treatments (antistatic-static) were 21% (4–38) ($P = .03$), 23% (6–41) ($P = .02$), and 25% (7–42) ($P = .01$), respectively. However, the overall T^2 was not significant ($P = .20$), possibly due to its 8-sided nature or to high correlations among the 3 end points. There was no significant carryover effect between treatments.

There were no significant differences in heart rate between the 2 treatment nights (Fig. 3). Also, there were no adverse experiences reported.

Discussion

The results of this study indicate that the static charge on a VHC decreases bronchodilator response and that eliminating the charge increases bronchodilatation during acute reversible bronchospasm without significantly increasing heart rate. This is the first study, to our knowledge, dem-

Table 2. Individual Subject Results

Subject Number	Baseline FEV_1*	FEV_1 at 4:00 AM	FEV_1 After 1 Puff	% Increase	FEV_1 After 2 Puffs	% Increase	FEV_1 After 4 Puffs	% Increase
				Antistatic Chamber				
18	2.19	1.74	2.24	29	2.47	42	2.71	56
20	1.91	1.07	2.00	87	2.05	92	2.25	110
35	1.17	1.04	1.42	36	1.80	73	2.08	100
36	2.73	1.60	3.00	88	3.55	122	3.99	149
37	3.40	2.17	3.10	43	3.42	58	3.79	75
56	4.13	2.86	3.62	27	4.19	47	4.39	53
87	1.69	1.43	2.21	54	2.52	76	2.64	85
Mean ± SD	2.46 ± 1.03	1.70 ± 0.64	2.50 ± 0.76	52 ± 26	2.90 ± 0.88	73 ± 28	3.10 ± 0.90	90 ± 34
				Static Chamber				
18	2.24	1.70	2.15	26	2.42	42	2.50	47
20	1.38	1.20	1.67	39	1.85	54	2.03	69
35	1.99	1.45	1.73	19	1.91	32	2.37	63
36	2.38	1.47	2.42	70	2.98	110	3.51	147
37	3.64	2.72	3.17	17	3.55	31	3.85	42
56	3.85	2.68	3.31	24	3.86	44	4.02	50
87	2.04	1.88	2.18	16	2.45	30	2.60	38
Mean ± SD	2.50 ± 0.90	1.87 ± 0.60	2.40 ± 0.60	30 ± 0.2	2.70 ± 0.78	49 ± 30	3.00 ± 0.80	65 ± 38

* On admission to the clinical research center in the evening.

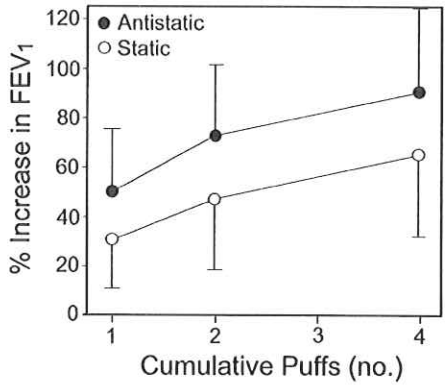

Fig. 2. The mean bronchodilator response expressed as percent increase in FEV_1 15 min after 1, 2, and 4 cumulative puffs of albuterol delivered by anti-static chamber or static chamber, in a crossover design, on different nights during nocturnal bronchospasm. There was a significant difference between treatments at each dose. The error bars represent standard deviations.

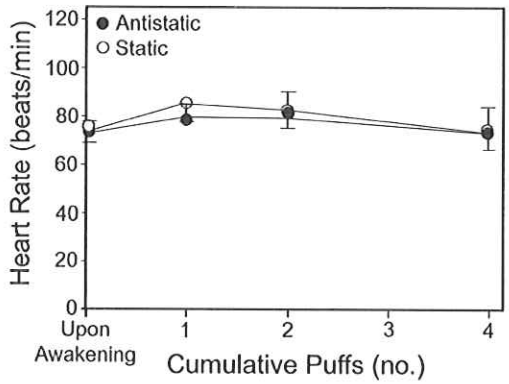

Fig. 3. Heart rate upon awakening with nocturnal bronchospasm and 15 min after 1, 2, and 4 cumulative puffs of albuterol delivered by anti-static or static chamber, in a crossover manner, on different nights. There was no significant difference in heart rate between the 2 treatments, because of the low cumulative dose. The error bars represent standard deviations.

onstrating a clinically relevant benefit from delivering a short-acting β_2 agonist through an anti-static chamber. It is likely that we were able to measure a difference between devices because the subjects had severe reversible airway obstruction upon awakening. This placed them on the ascending linear portion of the dose-response curve, where differences in dose delivered to the airways results in differences in improvement in FEV_1.

In previous studies of bronchodilator response during nocturnal bronchospasm, heart rate increased in a dose-dependent manner.[9,10] However, 14–16 cumulative puffs were administered in those studies, whereas only 4 cumulative puffs were administered in the present study. Thus, while the anti-static VHC increased the amount of albuterol delivered to the airways, the amount of systemically absorbed drug was probably too low to produce a measurable effect on heart rate.

The main limitation of this study is the small sample size. However, that was not because of lack of effort. We screened 88 subjects but could only complete 7. This indicates the need for multiple centers when using nocturnal bronchospasm as a clinical model. In fact, we had considered using a bioassay by methacholine challenge[15] to determine whether a difference in dose delivered could be detected, but chose the nocturnal model since it is more clinically relevant.

The results of this study support prescribing an antistatic VHC to deliver albuterol during an episode of acute bronchospasm. For patients who already have a conventional VHC, ESC can be markedly reduced by washing the device with an ionic detergent, and instead of rinsing, allowing the chamber to air dry.[16]

Previous studies in the emergency department treatment of acute asthma indicate that delivering albuterol by MDI through a VHC is at least as effective as delivery by nebulizer but faster, more convenient, and cheaper.[17] Also, in children, the MDI+VHC method is associated with less tachycardia than the nebulizer method.[18] Therefore, it would be worthwhile comparing the 2 types of VHCs in an emergency department study.

Conclusions

In conclusion, delivery of albuterol through an antistatic chamber provides a clinically relevant improvement in bronchodilator response during acute, reversible bronchospasm such as nocturnal bronchospasm.

REFERENCES

1. Crompton, GK. Problems patients have using pressurized aerosol inhalers. Eur J Respir Dis 1982;119(Suppl):101-104.
2. Newman SP, Newhouse MT. Effect of add-on devices for aerosol drug delivery: deposition studies and clinical aspects. J Aerosol Med 1996;9(1):55-70.
3. Dolovich MA, MacIntyre NR, Anderson PJ, Camargo CA Jr, Chew N, Cole CH, et al; American Association for Respiratory Care. Consensus statement: aerosols and delivery devices. Respir Care 2000; 45(6):589-596.
4. Wildhaber JH, Devadason SG, Hayden MJ, James R, Dufty AP, Fox RA, et al. Electrostatic charge on a plastic spacer device influences the delivery of salbutamol. Eur Respir J 1996;9(9):1943-1946.
5. Rau JL, Coppolo DP, Nagel MW, Avvakoumova VI, Doyle CC, Wiersema KJ, Mitchell JP. The importance of nonelectrostatic materials in holding chambers for delivery of hydrofluoroalkane albuterol. Respir Care 2006;51(5):503-510.
6. Anhøj J, Bisgaard H, Lipworth BJ. Effect of electrostatic charge in plastic spacers on the lung delivery of HFA-salbutamol in children. Br J Clin Pharmacol 1999;47(3):333-336.
7. Dompeling E, Oudesluys-Murphy AM, Janssens HM, Hop W, Brinkman JG, Sukhai RN, de Jongste JC. Randomised controlled study of clinical efficacy of spacer therapy in asthma with regard to electrostatic charge. Arch Dis Child 2001;84(2):178-182.
8. Ahrens RC. On comparing inhaled beta adrenergic agonists. Ann Allergy 1991;67(3):296-298.
9. Hendeles L, Beaty R, Ahrens R, Stevens G, Harman EM. Response to inhaled albuterol during nocturnal asthma. J Allergy Clin Immunol 2004;113(6):1058-1062.
10. Hendeles L, Marshik PL, Ahrens R, Kifle Y, Shuster J. Response to nonprescription epinephrine inhaler during nocturnal asthma. Ann Allergy Asthma Immunol 2005;95(6):530-534.
11. Peart J, Kulphaisal P, Orban JC. Relevance of electrostatics in respiratory drug delivery. Pharmagenerics 2003:84-87. http://www.touchbriefings.com/download.cfm?fileID=285. *Accessed May 22, 2012.*
12. Miller MR, Hankinson J, Brusasco V, Bargos F, Casaburi R, Coates A, et al. Standardisation of spirometry. Eur Respir J 2005;26(2):319-338.
13. Hankinson JL, Odencrantz JR, Fedan KB. Spirometric reference values from a sample of the general US population. Am J Respir Crit Care Med 1999;159(1):179-187.
14. Morrison DF. Multivariate statistical methods. New York: McGraw-Hill; 1967:148-152.
15. Ahrens RC, Hendeles L, Clarke WR, Dockhorn RJ, Hill MR, Vaughan LM, et al. Therapeutic equivalence of Spiros dry powder inhaler and Ventolin metered dose inhaler. A bioassay using methacholine. Am J Respir Crit Care Med 1999;160(4):1238-1243.
16. Piérart F, Wildhaber JH, Vrancken I, Devadason SG, Le Souëf PN. Washing plastic spacers in household detergent reduces electrostatic charge and greatly improves delivery. Eur Respir J 1999;13(3):673-678.
17. Hendeles L, Hatton RC, Coons TJ, Carlson L. Automatic replacement of albuterol nebulizer therapy by metered-dose inhaler and valved holding chamber. Am J Health Syst Pharm 2005;62(10): 1053-1061.
18. Schuh S, Johnson DW, Stephens D, Callahan S, Winders P, Canny GJ. Comparison of albuterol delivered by a metered dose inhaler with spacer versus a nebulizer in children with mild acute asthma. J Pediatr 1999;135(1):22-27.

Trudell Medical International
Aerosol Laboratory Report
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In Vitro Delay Testing of Different Sized Valved Holding Chambers

INTRODUCTION

Particle deposition caused by electrostatic attraction to the walls of valved holding chambers (VHCs) made from non-conducting polymer can significantly reduce pressurized metered dose inhaler (pMDI) medication delivery, especially at first use (1). Washing in ionic detergent followed by drip-drying to coat the interior surfaces with a conducting layer of surfactant is effective at counteracting these losses (2), however, the process is time consuming and therefore not followed, especially in the hospital setting.

The ***AeroChamber Plus® Flow-Vu®*** Anti-Static Valved Holding Chamber (AVHC) (Monaghan Medical Corp.) has been designed with a body manufactured from an electrostatic dissipative but transparent polymer so that it can be used without pre-treatment. Aerosol formation is therefore visible to both the health-care giver and patient. VHC volume (149 mL) has also been chosen to optimize the delivery of medication to the un-coordinated patient.

The design intent is to ensure that most of the aerosol delivered to the VHC at pMDI actuation remains suspended if a poorly coordinated patient delays inhalation.

PERFORMANCE COMPARISON

An *in vitro* comparison of 5 VHCs (n=4) was undertaken with Flovent†-HFA (110 µg/actuation fluticasone propionate (FP), GSK Inc) to investigate the affect of an imposed delay between pMDI actuation and inhalation. Simulated delay times of 2, 5 and 10-s were created using a purpose built mechanical shutter.

This approach conforms with the opinion from European authorities that testing of VHCs should be undertaken under such conditions, and that the compendia no-delay test is unsuitable, since it does not properly mimic patient use.

METHODOLOGY

An abbreviated Andersen 8-stage impactor (Thermo Andersen, Smyrna, GA) with a USP/EP induction port was used at 28.3 L/min for the measurements without delay in accordance with the compendial procedure (3).

Delay simulation was achieved by using a purpose built adapter located on axis between VHC mouthpiece and induction port (Figure 1). With this apparatus the impactor could be operated at the desired flow rate, since air was introduced via a by-pass channel on the bottom of the adapter facing the induction port. This apparatus allows for the impactor to operate normally avoiding the risk of capturing any aerosol that might have escaped as the propellant expanded following inhaler actuation.

Five actuations from the pMDI were delivered per measurement, and an assay for FP recovered from the VHC, induction port and impactor using methanol was subsequently undertaken by HPLC-UV spectrophotometry at a wavelength of 239 nm.

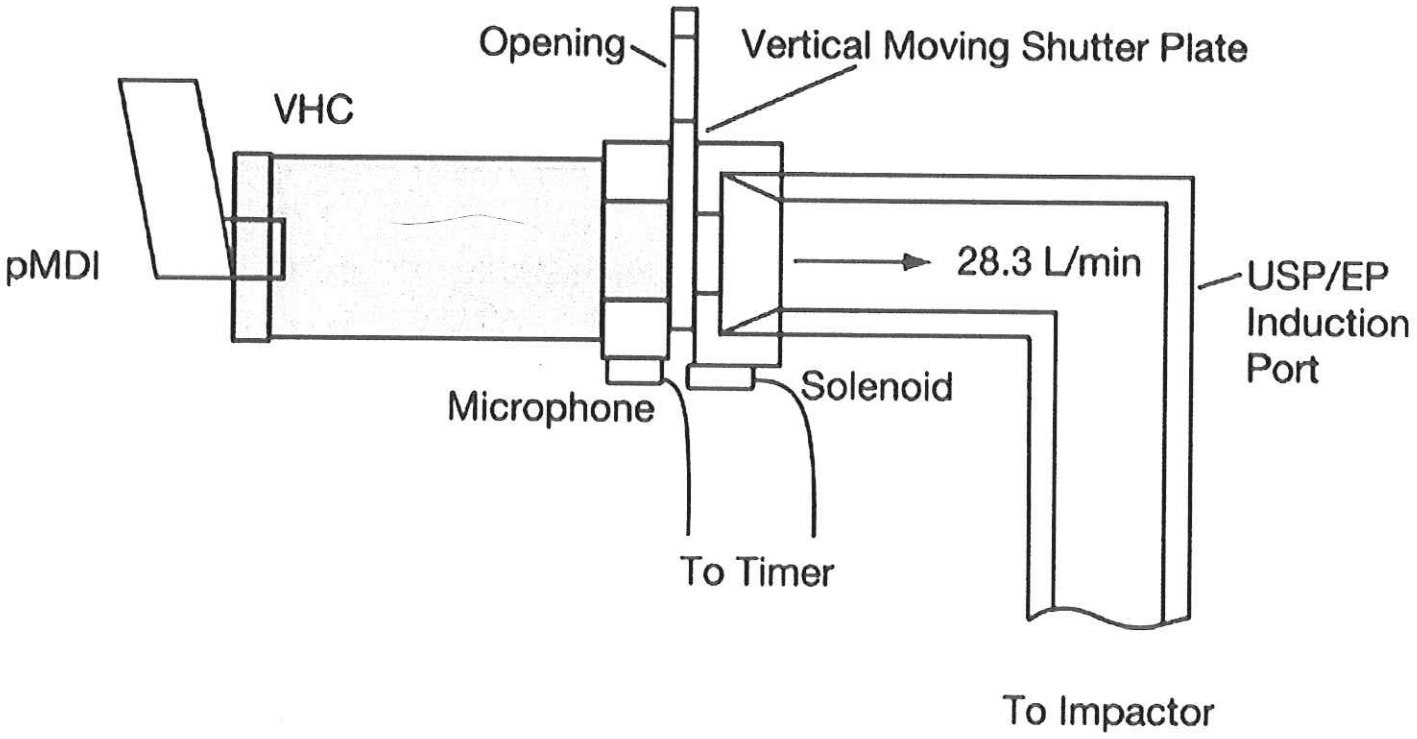

Figure 1. Andersen 8-stage impactor (Thermo Andersen, Smyrna, GA) with a USP/EP induction port used at 28.3 L/min. Delay simulation was achieved by interposing a mechanical shutter in an adapter that located on axis between VHC mouthpiece and induction port.

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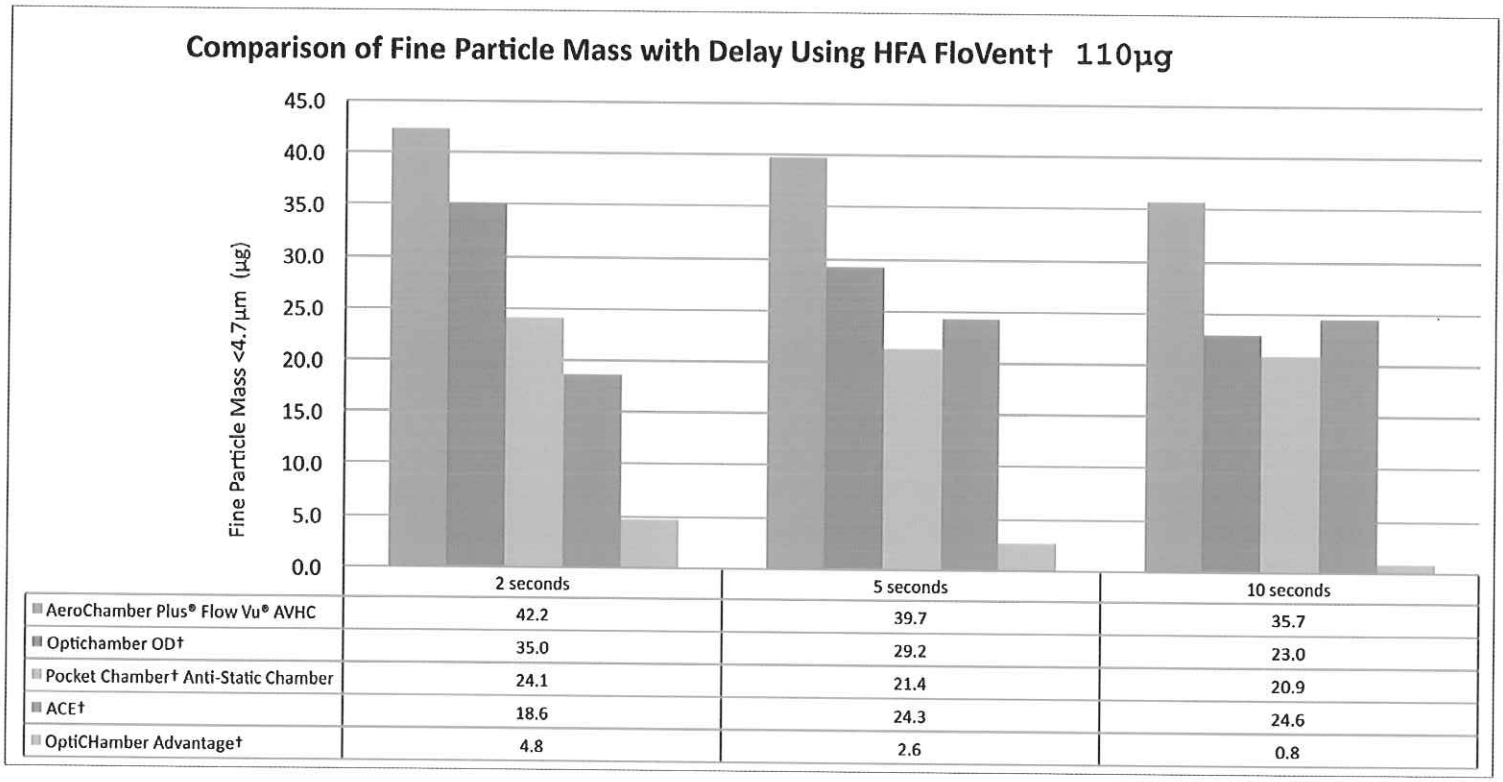
RESULTS

When conducting measurements with delay, a mechanical shutter was interposed in an adapter that was located on axis between VHC mouthpiece and the induction port (Figure 1). The shutter remains closed during the delay period, but the impactor is operated at the desired flow rate, since air is introduced via a by-pass channel on the bottom of the adapter facing the induction port.

The pMDI is actuated into the VHC on test which is directed at a microphone located on the adapter. The microphone detects the sound emitted from the actuation of the inhaler. This starts a timer that operates the shutter after the desired delay interval. Following the delay interval, the aerosol is sampled as soon as the shutter opens.

Full mass recoveries of label claim (110 µg ± 15%) was obtained for all VHCs evaluated, validating the methodology.

Table 1. Comparison of Fine Particle Mass for 5 VHCs with delay using HFA Flovent†-110



	2 seconds	5 seconds	10 seconds
AeroChamber Plus® Flow Vu® AVHC	42.2	39.7	35.7
Optichamber OD†	35.0	29.2	23.0
Pocket Chamber† Anti-Static Chamber	24.1	21.4	20.9
ACE†	18.6	24.3	24.6
OptiCHamber Advantage†	4.8	2.6	0.8

Fine particle mass was observed to decrease significantly with increasing delay for the Optichamber Diamond† and Anti-Static Pocket Chamber† VHCs (Table 1), whereas the ***AeroChamber Plus® Flow-Vu®*** AVHC remained relatively stable throughout (Δ in FPM).

At all delay conditions the ***AeroChamber Plus® Flow-Vu®*** AVHC delivered statistically more fine particle mass ($p<0.018$).

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CONCLUSIONS

The data reveals inhalation delays affect drug delivery and there is significant difference in drug delivery between chamber brands. Differences in patient technique directly impacts inhalation delays, especially pediatric patients who require several breaths to evacuate the chamber of medication. Therefore it is advisable to utilize a chamber that has the maximum amount of drug available for the longest period of time.

REFERENCES

1. Bisgaard, H., Anhøj, J., and Wildhaber, J.H. (2002), "Spacer devices," in Drug Delivery to the Lung, Bisgaard, H., O'Callaghan, C., and Smaldone, G.C. (eds.), Marcel Dekker Inc., N.Y., 389-420.

2. Piérart, F., Wildhaber, J.H., Vrancken, I., Devadason, S.G., and LeSouëf, P. (1999), "Washing plastic spacers in household detergent reduces electrostatic charge and greatly improves delivery," Eur. Respir. J., 13, 673-678.

3. USP 26-NF 21 (2003), Chapter 601 – "Physical tests and determinations: Aerosols," United States Pharmacopeia, Rockville, MD, USA, 2105-2123.

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PN 79116-00 06/12

UNIVERSITY OF MARYLAND
SCHOOL OF MEDICINE

A METERED DOSE INHALER BASED ACUTE ASTHMA TREATMENT PROTOCOL IS AN EFFECTIVE AND EFFICIENT PROCESS FOR CHILDREN WITH MILD TO MODERATE ASTHMA EXACERBATIONS IN AN URBAN PEDIATRIC EMERGENCY DEPARTMENT

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BACKGROUND: Asthma accounts for a significant proportion of pediatric Emergency Department (ED) visits and is one of the leading causes of childhood hospitalization. Multiple studies have demonstrated that metered dose inhalers with valved holding chambers (MDI-VHC) are effective modalities for delivery of beta-agonists in the treatment of acute asthma. Compared to nebulizers, MDI-VHCs have been shown to lead to reduced hospitalization rates, shortened ED stays and decreased costs. However, the use of MDI-VHC in the ED based treatment of acute asthma remains limited.

Between 2003 and 2010 the Pediatric ED at the University of Maryland Hospital for Children (UMHC) embarked on an effort to develop and implement a MDI-VHC based asthma protocol for children with mild to moderate acute asthma and demonstrate its effectiveness. Children with severe or critical acute asthma were treated with nebulizer therapy.

METHODS: A retrospective search of the electronic medical records was conducted to identify patients treated for the complaint of acute asthma (ICD-9 Code 493.--) between January 1st and December 31st 2009 in the Pediatric ED. Patients with acute asthma were identified based on their chief complaint, enrollment in asthma protocol and/or final discharge diagnosis.

RESULTS: Between January 1 and December 31, 2009, a total of 1115 patients were treated for acute asthma in the Pediatric ED.

	Treated with MDI-VHC Only	Treated with Nebulizers Only	Treated with MDI-VNC & Nebulizer
Total Number of Patients	906	89	120
Percent of Total	81%	8%	11%
Average Age (Years)	7.6	6.3	7.2
Average ED Length of Stay (minutes)	187	290	335
Inpatient Admission Rate	1.3%	50.6%	51.7%
72-hour Return Rate	2.1%	2.2%	5.0%

The patient age range was 2-18 years with a median age of 6 years and 60% were male. Eighty one percent of patients were treated with MDI-VHC's only, 8% were treated with nebulizers only and 11% were treated with both modalities. Inpatient admission rates were 1.3% for those treated solely with MDI-VHC's, 51% for those treated solely with nebulizers and 52% for those treated with both modalities.

For those who did not require inpatient admission, the average Emergency Department length of stay was 186 minutes for the MDI-VHC only group, 290 minutes for the nebulizer only group and 335 minutes for those treated with both modalities. Among those discharged from the ED, the 72-hour return rate was 2.1% for those treated solely with MDI-VHC's, 2.2% for those treated solely with Nebulizers and 5.0% for those treated with both modalities.

CONCLUSIONS: A metered dose inhaler based asthma protocol can be an effective and efficient process for the treatment of mild to moderate acute asthma exacerbations in the 2 to 18-year age group.

Poster presented at the 2010 AARC Congress, Las Vegas, Nevada

DELIVERY OF AEROSOLISED FLUTICASONE PROPIONATE VIA VALVED HOLDING CHAMBER WITH FACEMASK: BEWARE FACEMASK LEAKAGE

Sharpe R, Nagel MW, Avvakoumova V, Schneider H, Ali R and Mitchell JP

Trudell Medical International, London, Canada

BACKGROUND

- Leakage between facemask and face may result in severe medication loss by Valved Holding Chamber (VHC) with facemask as patient interface[1]
- Our study evaluated how an Inspiratory Indicator can be used to avoid leakage

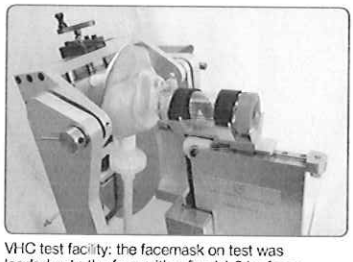
MATERIALS AND METHODS

- An infant face with realistic soft-tissue modeling (ADAM-III, Trudell Medical International, London, Canada[2]) was used to simulate the facemask-face seal

ADAM-III INFANT FACE MODEL

Front view of face showing soft tissue modeling

Naso-pharynx; the aerosol collection filter was located at the base of the model in its "trachea"



VHC test facility: the facemask on test was loaded onto the face with a fixed 1.6 kg force

- Fluticasone propionate (FP, 50 µg/actuation, GSK, Canada) was used as the aerosol challenge medication
- FP recovered from filter was quantified by validated HPLC-spectrophotometry as % label claim (LC)
- Delivery of FP via new anti-static ***AeroChamber Plus** *Flow-Vu**** VHC with infant mask (***AC-Plus***, Trudell Medical International)
- OptiChamber† Diamond† VHC/LiteTouch† small-mask (OD, Philips-Respironics, Parsipanny, NJ, USA) as benchmark device
- n=5 devices/group
- Tidal breathing simulated
  - Tidal volume (Vt)=155-mL
  - Duty cycle=33%
  - Rate= 25 breaths/min
- This tidal volume was larger than normal for this infant model in order to detect facemask-to-face leakage more precisely
  - Both VHCs would be expected to benefit equally in terms of FP mass collected by the filter as a result of this modification
- Each facemask was applied to the face with the same clinically-appropriate force (1.6 kg)
- The Inspiratory Indicator on the ***AC-Plus*** was observed to be moving

The Inspiratory Indicator movement is linked to the opening of the inhalation valve at the start of inspiration. It only moves if there is no leakage between facemask and face

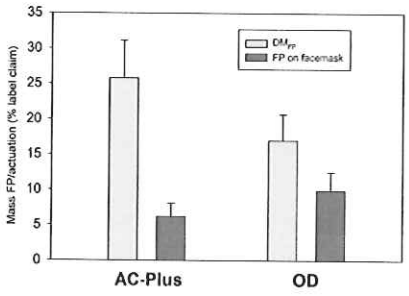
AeroChamber Plus** *Flow-Vu* Anti-Static Chamber Infant Mask
Trudell Medical International

- Inasmuch as the OD does not have an Inspiratory Indicator, it was not possible to do more to ensure that its facemask was applied carefully to the face with the same force

OptiChamber† Diamond†
Philips-Respironics

- FP was recovered from the model nasopharynx and from the filter (lung dose)
  - The filter-collected mass would be equivalent to the delivered mass (DM_{FP}) to the lungs

RESULTS



- DM_{FP} (mean ± SD) was significantly greater from ***AC-Plus*** (25.8±5.3% LC) than OD (17.0±3.7% LC)
  - Unpaired t-test, ρ=0.019
- FP recovered from the facemask of the ***AC-Plus*** (6.2±1.9% LC), was lower than that determined with the OD facemask (9.9±2.6% LC)

CONCLUSIONS

- The decreased aerosol delivery from the OD is explainable in terms of the presence of leakage between facemask and face

REFERENCES

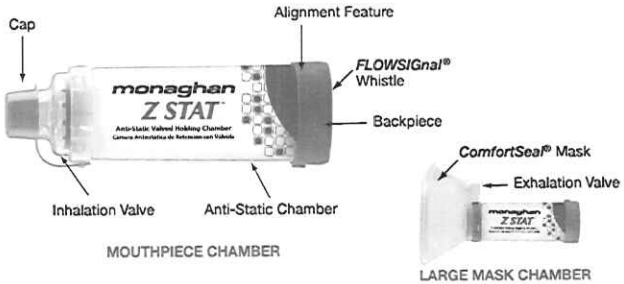
1 Esposito-Festen JE, Ates B, Van Vliet FLM, Verbraak AFM, de Jongste JC, and Tiddens HAWM. *Effect of a facemask leak on aerosol delivery from a pMDI-spacer system.* J Aerosol Med. 2004;17:1-6.

2 Mitchell JP, Finlay JB, Nuttall JM, Limbrick M, Nagel MW, Avvakoumova V, MacKay HA, Ali RS, and Doyle CC. *Validation of a new model infant face with nasopharynx for the testing of valved holding chambers with facemask as a patient interface.* Respiratory Drug Delivery 2010. Davis Healthcare International Publishing LLC, River Grove, IL; pp. 777-780.

monaghan Z STAT™

Anti-Static Valved Holding Chamber

MOUTHPIECE
LARGE MASK

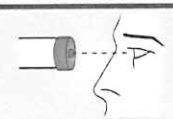
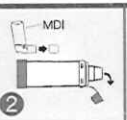
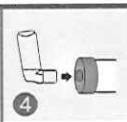
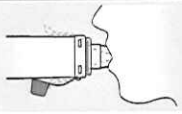
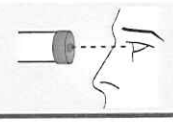
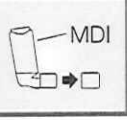
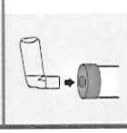
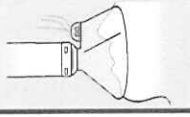
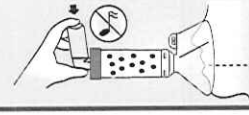
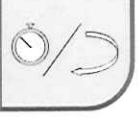


INDICATIONS FOR USE

This product is intended to be used by patients who are under the care or treatment of a physician or licensed healthcare professional. The device is intended to be used by these patients to administer aerosolized medication from most pressurized Metered Dose Inhalers. The intended environments for use include the home, hospitals and clinics.

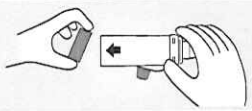
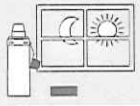
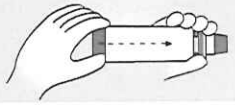
INSTRUCTIONS FOR USE

THIS PRODUCT CAN BE USED RIGHT OUT OF PACKAGE. BEFORE USE, ENSURE THESE INSTRUCTIONS AND THE INSTRUCTIONS SUPPLIED WITH THE METERED DOSE INHALER (MDI) HAVE BEEN READ.

	1	2	3	4	5	6	7
MOUTHPIECE							
	Carefully examine the product for damage, missing parts or foreign objects. Remove any foreign objects prior to use. The product should be replaced IMMEDIATELY if there are any damaged or missing parts. If necessary, use the Metered Dose Inhaler (MDI) alone until a replacement is obtained. If the patient's symptoms worsen, please seek immediate medical attention.	Remove cap(s) from the MDI and chamber (if applicable).	Shake the MDI immediately before each use as per the instructions supplied with the MDI.	Insert the MDI into the backpiece of the chamber.	Put mouthpiece into mouth and close lips around it to ensure an effective seal.	Breathe out gently and depress the MDI at the beginning of a slow inhalation. Breathe in slowly and deeply through the mouth until a full breath has been taken. Hold breath for 5 – 10 seconds, if possible. Otherwise, keep lips tight on the mouthpiece to maintain seal for 2 – 3 breaths after the MDI is depressed. *Slow down inhalation if you hear the **FLOWSIGnal**® Whistle sound.* **Administer one (1) puff at a time.**	Follow instructions supplied with the MDI on how long to wait before repeating steps 3 – 6 as prescribed.
LARGE MASK							
					Apply mask to face and ensure an effective seal.	Breathe out gently and depress the MDI at the beginning of a slow inhalation. Maintain seal for 5 – 6 breaths after the MDI is depressed. *Slow down inhalation if you hear the **FLOWSIGnal**® Whistle sound.* **Administer one (1) puff at a time.**	

CLEANING INSTRUCTIONS FOR MASK AND MOUTHPIECE CHAMBERS

THIS PRODUCT CAN BE USED RIGHT OUT OF THE PACKAGE AND THEN CLEANED WEEKLY.

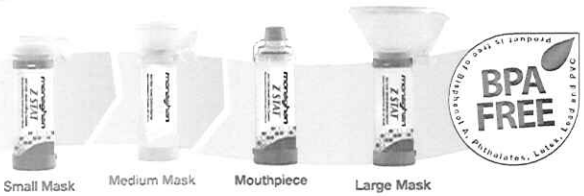
1	2	3	4	5
				
Remove the backpiece only. Do not tamper with valve during cleaning or disassemble the product beyond what is recommended or damage may result. For mask product, do not remove mask.	Soak the parts for 15 minutes in a mild solution of liquid dish detergent and lukewarm clean water. Agitate gently.	Rinse parts in clean water.	Shake out excess water from the parts and allow to air dry in a vertical position. Ensure parts are dry before reassembly.	To reassemble, press firmly to attach the backpiece. For mouthpiece models, the protective cap should always be placed on the mouthpiece when the product is not in use.

Notes:
- Storage and operating range 5° C - 40° C (41° F - 104° F) at 15 to 95% relative humidity.
- Product may need to be replaced after 12 months of use. Environmental conditions, storage and proper cleaning can affect product life span.
- THIS PRODUCT CONTAINS NO LATEX.
- Do not share this medical device.
- Clarity of the chamber is a result of the properties of the ***StatBan*** ® anti-static material.
- If you notice medication build-up in your chamber, wash the inside of the chamber gently with a soft cloth.

Cautions:
- **To ensure proper performance this product should only be cleaned according to these instructions.**
- **Do not leave the chamber unattended with children.**
- **Federal (USA) law restricts the sale of this device on or by the order of a physician.**

Product Reorder Number:
MOUTHPIECE: 79710Z/case 10, 79750Z/case 50
LARGE MASK: 80710Z/case 10

℞ Only



Manufactured by:

monaghan™

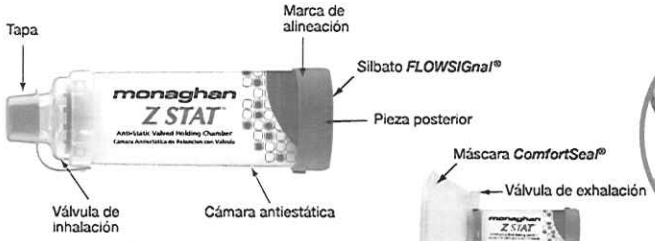
Monaghan Medical Corporation, 5 Latour Ave., Suite 1600, Plattsburgh, NY 12901
www.monaghanmed.com

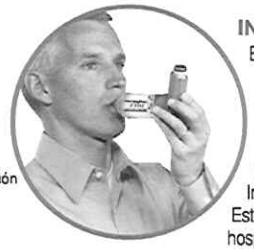
PN 79903-00 04/10

monaghan Z STAT™

Cámara Antiestática de Retención con Válvula

BOQUILLA
MÁSCARA GRANDE



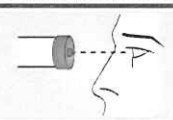
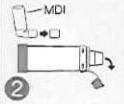
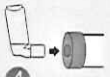
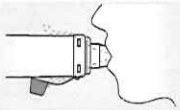
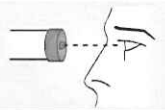
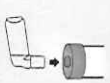
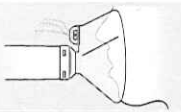


INDICACIONES DE USO

Este producto está diseñado para ser utilizado por pacientes al cuidado o en tratamiento por un médico o un profesional de la salud matriculado. El propósito de este instrumento es utilizarlo para administrar a los pacientes medicamentos desde la mayoría de los Inhaladores presurizados de dosis medidas. Estos instrumentos pueden utilizarse en el hogar, hospitales y clínicas.

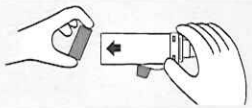
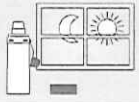
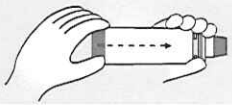
INSTRUCCIONES DE USO

ESTE PRODUCTO PUEDE UTILIZARSE DIRECTAMENTE DESPUÉS DE RETIRADO DEL ENVASE. ANTES DE USARLO, ASEGÚRESE DE HABER LEÍDO ESTAS INSTRUCCIONES, ASÍ COMO LAS QUE ACOMPAÑAN EL INHALADOR DE DOSIS MEDIDAS (MDI).

	1	2	3	4	5	6	7
BOQUILLA	 Revise detenidamente el producto para identificar señales de daño, piezas faltantes u objetos ajenos. Quite los objetos ajenos antes de usar el instrumento. El producto debe reemplazarse INMEDIATAMENTE si tiene piezas dañadas o faltantes. Si es necesario, siga utilizando el inhalador MDI sólo hasta recibir uno de reemplazo. Si los síntomas del paciente empeoran, procure atención médica en forma inmediata.	 Quite las tapas del inhalador MDI y la cámara (si corresponde).	 Siempre agite el inhalador MDI inmediatamente antes de usarlo, según las instrucciones entregadas con el inhalador.	 Introduzca el inhalador MDI en la pieza posterior de la cámara.	 Introduzca la boquilla en la boca y cierre los labios a su alrededor para un correcto sellado.	 Exhale suavemente y presione el inhalador MDI al comenzar una inhalación lenta. Inhale con suavidad y profundamente por la boca hasta finalizar una respiración completa. Retenga la respiración durante 5 a 10 segundos, si eso es posible. En caso contrario, mantenga los labios apretados contra la boquilla para que estén sellados durante 2 a 3 respiraciones después de presionar el inhalador MDI. *Inhale más lentamente si oye el silbido del* ***FLOWSIGnal*®. Administre una (1) descarga de aire por vez.**	 Respete las instrucciones del inhalador MDI acerca de cuánto tiempo debe esperar para repetir los pasos 3 a 6 como se indica.
MÁSCARA GRANDE		 MDI			 Coloque la máscara en el rostro y asegúrese su correcto sellado.	 Exhale suavemente y presione el inhalador MDI al comenzar una inhalación lenta. Mantenga el sellado por 5 a 6 respiraciones después de presionar el inhalador MDI. *Inhale más lentamente si oye el silbido del* ***FLOWSIGnal*®. Administre una (1) descarga de aire por vez.**	

INSTRUCCIONES PARA LIMPIAR LAS CÁMARAS DE LA MÁSCARA Y LA BOQUILLA

ESTE PRODUCTO PUEDE UTILIZARSE DIRECTAMENTE DESPUÉS DE RETIRADO DEL ENVASE Y LUEGO DEBE LIMPIARSE SEMANALMENTE.

1	2	3	4	5
 Sólo quite la pieza posterior. No manipule la válvula en forma indebida durante la limpieza o desarme el producto más de lo que se recomienda ya que podría dañarse. Para el producto de la máscara, no saque la máscara.	 Sumerja las piezas durante 15 minutos en una solución suave de detergente líquido para vajilla y agua limpia tibia. Agite con suavidad.	 Enjuague las piezas en agua limpia.	 Sacuda las piezas para eliminar el exceso de agua y déjelas secar al aire, en posición vertical. Asegúrese de que las piezas estén secas antes de rearmar el conjunto.	 Para rearmarlo,presione con firmeza para conectar la pieza posterior. Para los modelos con boquilla, la tapa protectora siempre debe colocarse en la boquilla cuando el producto no se esté usando.

Notas:
- Márgenes de almacenamiento y operativos: De 5 a 40 °C (41 a 104 °F) a entre 15 y 95% de humedad relativa.
- El producto tal vez deba ser reemplazado después de doce (12) meses en uso. Las condiciones ambientales, de almacenamiento y la limpieza apropiada pueden repercutir en la duración del producto.
- ESTE PRODUCTO NO CONTIENE LÁTEX.
- No comparta este instrumento médico.
- La transparencia de la cámara es resultado de las propiedades antiestáticas del material ***StatBan*®**.
- Si nota una acumulación del medicamento en la cámara, lave el interior de la cámara delicadamente con un paño suave.

Precauciones:
- **Para asegurar su funcionamiento apropiado, este producto sólo debe limpiarse conforme a estas instrucciones.**
- **Con niños, no deje la cámara sin supervisión.**
- **La legislación federal de los Estados Unidos restringe la venta de este dispositivo por parte o a pedido de un médico.**

Números para pedidos del producto:
BOQUILLA: 79710Z/caja 10, 79750Z/caja 50
MÁSCARA GRANDE: 80710Z/caja 10

Sólo Rx

Máscara Pequeña Máscara Mediana Boquilla Máscara Grande

Distribuido por:

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www.monaghanmed.com

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