RESEARCH IN EMS [AND TRAUMA] SYSTEMS

Jan L Jensen ACP MAHSR
Research Leader
Emergency Health Services
Dalhousie University
THE TROUBLE WITH EXPERTS

“I know nothing about the subject, but I’m happy to give you my expert opinion.”
WHO AM I?
My Experiences
Paramedic & EMS Research

My area of research

• Evidence-based practice in EMS
• Health services delivery in EMS
• Paramedic clinical decision-making

Nova Scotia

• Flourishing EMS research program

Canada

• National EMS Research Agenda
Let’s Chat
COLLABORATION FOR EMS RESEARCH

Emergency Medical Care Inc.

Division of Emergency Medical Services
DEPARTMENT OF EMERGENCY MEDICINE
DALHOUSIE UNIVERSITY
Inspiring Minds

Emergency Health Services

NOVA SCOTIA PREHOSPITAL RESEARCH
BUILDING PROGRAMS OF RESEARCH

Systems
- [Alternative] Delivery of EMS Care
- Evidence-based practice/research

Safety
- Paramedic clinical decision-making

Clinical
- Resuscitation
- Airway Management
- Geriatrics
OUR GROWING RESEARCH PROGRAM

- Design: 5
- Data Collection: 6
- Analysis: 7
- Writing/Presenting: 6
- In Press: 3

Ext. Projects
EHS Data Warehouse

EHS Data

MFR

Comm

ePCR

South Cumberland Collaborative Emergency Centre
WHAT CAN BE LEARNED FROM EMS DATA?

PROCESS OUTCOMES: Choreography of EMS calls

CLINICAL OUTCOMES: Link interventions with vital signs and scores

SAFETY OUTCOMES: E.g., relapse calls

SYSTEM OUTCOMES: E.g., turn-around times, time-on-task
“In God we trust. All others must bring data.”

—Robert Hayden, Plymouth State College
INDICATORS OF SUCCESS: RESEARCH GRANT FUNDS AWARDED TO EHS INVESTIGATORS

Apr 1 2010 – Mar 31 2011: $70,891.66
Apr 1 2011 – Mar 31 2012: $33,370.70
Apr 1 2012 – present: $32,917.17

Sources:
• NS Health Research Foundation
• Dalhousie Network for End of Life Studies (NELS)
• Cdn Institutes of Health Research
• Cdn Police Research Centre
• Paramedic Association of Canada
• Calgary EMS Foundation
• Medic Alert Foundation
• Dalhousie University Division of EMS
INDICATORS OF SUCCESS

Publications:

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>4</td>
<td>7</td>
<td>3 (+3 in press)</td>
</tr>
</tbody>
</table>

• 8 paramedic research assistants over last two years
• Another 8 paramedics who were lead or co-investigators
AN EVIDENCE-BASED CULTURE
EMS AND PARAMEDIC RESEARCH IN NOVA SCOTIA
EMS RESEARCH IN CANADA

Canadian National EMS Research Agenda

BARRIERS

SUGGESTED TOPICS

STRENGTHS & OPPS

RECOMMENDATIONS FOR THE FUTURE

www.emscc.ca/nra
BARRIERS TO CONDUCTING EMS RESEARCH IN CANADA -related to trauma research

TIME, OPPORTUNITIES AND FUNDING

1. There are few funding sources for EMS research projects or for EMS systems to conduct research.

2. There are very few EMS research jobs or research salary support, and there is a lack of dedicated time for EMS providers who are interested to conduct or assist in research.
Barriers to Conducting EMS Research in Canada - related to trauma research

Research Education and Mentorship

4. There are few opportunities for research mentorships, outside of fellowship programs for physicians.

Culture of Research and Research Collaboration

6. There is little or no relationship between EMS services and academia, and governments, hospitals, universities and EMS services often don’t work together to conduct studies.
Barriers to Conducting EMS Research in Canada

- related to trauma research

Structure, Process and Outcome

9. It can be difficult to obtain informed consent in clinical studies in the EMS setting.

10. EMS data is sometimes not clean (e.g., data points not well defined, not all users understand what information to enter, etc.), and there are inconsistencies between how different services measure, collect and analyze their data. EMS datasets are difficult to link with hospital data to obtain outcome data and to conduct population/epidemiologic studies.
RECOMMENDATIONS FOR THE FUTURE
2. Strengthen research partnerships between EMS academic centres, systems, regulators, educators and national associations

<table>
<thead>
<tr>
<th>Time, opportunities, and funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Strategically market the importance of EMS research to other agencies, health groups and the public.</td>
</tr>
<tr>
<td>2. Strengthen research partnerships between EMS academic centres, systems, regulators, educators and national associations.</td>
</tr>
<tr>
<td>3. Increase funding opportunities for EMS research. Universities should consider EMS provision of public health, academic appointments, so they can engage in academic research.</td>
</tr>
<tr>
<td>4. Universities should consider EMS research provision of academic appointments, so they can engage in academic research.</td>
</tr>
<tr>
<td>5. Create opportunities for EMS providers to engage in collective agreements if necessary.</td>
</tr>
<tr>
<td>6. Integrate research literacy and research-oriented EMS providers’ and EMS physicians’ foundations.</td>
</tr>
<tr>
<td>7. Provide scholarships for EMS providers, including research-based graduate degrees.</td>
</tr>
<tr>
<td>8. Information should be purposefully disseminated to research activities occurring in Canada.</td>
</tr>
<tr>
<td>9. Increase multidisciplinary strategic partnerships in EMS research.</td>
</tr>
<tr>
<td>10. Engage EMS providers and managers early during the planning phases.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Education and mentorship</th>
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</thead>
<tbody>
<tr>
<td>11. EMS systems administrators should budget for research projects during annual strategic planning.</td>
</tr>
<tr>
<td>12. EMS researchers must undertake comprehensive knowledge translation initiatives, including delivering research results to EMS providers and administrators.</td>
</tr>
<tr>
<td>13. Evidence-based decision-making should be encouraged in EMS systems. If evidence is lacking, further research should be undertaken.</td>
</tr>
<tr>
<td>14. The network of Canadians interested in EMS research should be formalized, possibly as a national EMS research organization or conferences.</td>
</tr>
<tr>
<td>15. EMS researchers and administrators should better inform research ethics boards about the nature of EMS research and request EMS experts participate on review committees.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure, Process and Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Highlight EMS research in special issues or sections of the <em>Canadian Journal of Emergency Medicine</em>.</td>
</tr>
<tr>
<td>17. EMS data should be linked with hospital and other datasets.</td>
</tr>
<tr>
<td>18. Create a national EMS data dictionary of operational and clinical terms.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Future Directions for the EMS Research Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. The EMS Research Agenda needs to be viewed as an ongoing project. An implementation, evaluation and renewal plan should be designed and this process should include mapping gaps in EMS research.</td>
</tr>
</tbody>
</table>
8. Information should be purposefully disseminated to EMS providers about EMS research activities occurring in Canada.
13. Evidence-based decision-making should be encouraged in EMS systems. If evidence is lacking, further research should be undertaken.
17. EMS data should be linked with hospital and other datasets

<table>
<thead>
<tr>
<th>Nineteen recommendations were found to be important for the future of Canadian EMS research:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Strategically market the importance of EMS research to other agencies, health groups and the public.</td>
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<td>2. Strengthen research partnerships between EMS academic centres, systems, regulators, educators and national associations.</td>
</tr>
<tr>
<td>3. Increase funding opportunities for EMS research infrastructure and studies.</td>
</tr>
<tr>
<td>4. Universities should consider EMS providers with graduate training for academic appointments, so they can engage in academic EMS research.</td>
</tr>
<tr>
<td>5. Create opportunities for EMS providers to work in research positions. Review collective agreements if necessary.</td>
</tr>
<tr>
<td>6. Integrate research literacy and research competencies into EMS providers’, managers’ and EMS physicians’ foundational and continuing education.</td>
</tr>
<tr>
<td>7. Provide scholarships for EMS providers, managers and physicians to take research-based graduate degrees.</td>
</tr>
<tr>
<td>8. Information should be purposefully disseminated to EMS providers about EMS research activities occurring in Canada.</td>
</tr>
<tr>
<td>9. Increase multidisciplinary strategic partnerships to broaden the topics studied in EMS research.</td>
</tr>
<tr>
<td>10. Engage EMS providers and managers early in the research process and include them on study teams.</td>
</tr>
<tr>
<td>11. EMS systems administrators should budget for research projects during annual strategic planning.</td>
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<tr>
<td>12. EMS researchers must undertake comprehensive knowledge translation initiatives, including delivering research results to EMS providers and administrators.</td>
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<td>13. Evidence-based decision-making should be encouraged in EMS systems. If evidence is lacking, further research should be undertaken.</td>
</tr>
<tr>
<td>14. The network of Canadians interested in EMS research, possibly as a national EMS research organization, should be established and encouraged to engage in research.</td>
</tr>
<tr>
<td>15. EMS researchers and administrators should be knowledgeable about the nature of EMS research on review committees.</td>
</tr>
<tr>
<td>16. Highlight EMS research in special issues of journals and in public presentations.</td>
</tr>
<tr>
<td>17. EMS data should be linked with hospital and other datasets.</td>
</tr>
<tr>
<td>18. Create a national EMS data dictionary of EMS and non-EMS data for future research.</td>
</tr>
</tbody>
</table>

**Structure, Process and Outcome**

- Highlight EMS research in special issues of *Emergency Medicine.*
- The EMS Research Agenda needs to be visible in the implementation, evaluation and renewal plan. The plan should be designed and the process should include mapping gaps in EMS research.
THE CANADIAN NATIONAL EMS RESEARCH AGENDA
**Recommendation #15.**

EMS researchers and administrators should better inform research ethics boards about the nature of EMS research and request EMS experts participate on review committees.

**Is this important to our system/institution/association?**

Consider if this recommendation is relevant to your setting.

<table>
<thead>
<tr>
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<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
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</table>

**How feasible is it to put this in place?**

Consider resources, time and collaborations required.

<table>
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**Impact**

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<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
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</thead>
</table>

**Feasibility**

<table>
<thead>
<tr>
<th></th>
<th>Easy</th>
<th>Hard</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>5</td>
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</tbody>
</table>
A Research Agenda for NB Trauma Research?

• Useful for exposing barriers to the Trauma Research enterprise
• Multidisciplinary sample of trauma research stakeholders
• Recommendations for the future and priority setting useful for strategic planning and investment
To appraise EMS body of knowledge.

To stimulate debate and growth towards evidence-based EMS protocols.

To be a resource for the development of local EMS protocols; perhaps with a movement towards "best practice" paramedic protocols.

To be a guide to help recognize opportunities for prehospital research.

To develop a process of using evidence to evaluate practice change suggestions made by paramedics.

THE CANADIAN PREHOSPITAL EVIDENCE BASED PRACTICE (PEP) PROJECT
Each article is given a score – Level and Direction of Evidence

<table>
<thead>
<tr>
<th>Level</th>
<th>Direction</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Neutral (Yellow)</td>
<td>Zaleski L, Abello D, Martin G: The esophageal detector device. Anesthesiology 1993;70:244-247 Medline</td>
</tr>
</tbody>
</table>

Each article has a link - usually to PubMed
## PEP Level of Evidence

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Evidence from at least one properly randomized controlled trial or systematic reviews or meta-analyses that contain RCTs</td>
</tr>
<tr>
<td>II</td>
<td>Evidence from non-randomized studies with a comparison group or systematic reviews of non-randomized studies with a comparison group. Registry-type studies with comparisons made are included here.</td>
</tr>
<tr>
<td>III</td>
<td>Evidence from studies with no comparison group, simulation studies, or animal studies.</td>
</tr>
</tbody>
</table>
# PEP Direction of Evidence

<table>
<thead>
<tr>
<th>Colour</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GREEN</strong></td>
<td>Direction of results of this study are supportive for the use of this intervention</td>
</tr>
<tr>
<td><strong>YELLOW</strong></td>
<td>Direction of the results of this study are neutral for the use of this intervention</td>
</tr>
<tr>
<td><strong>RED</strong></td>
<td>Direction of the results of this study oppose the use of this intervention</td>
</tr>
<tr>
<td><strong>WHITE</strong></td>
<td>Direction of results of this study are not yet evaluated</td>
</tr>
</tbody>
</table>
# Arrest/Unconscious Airway Management

<table>
<thead>
<tr>
<th>STRENGTH OF RECOMMENDATION FOR INTERVENTION</th>
<th>DIRECTION OF RECOMMENDATION FOR INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SUPPORTIVE (Green)</td>
</tr>
<tr>
<td>1 (strong evidence exists)</td>
<td></td>
</tr>
<tr>
<td>2 (fair evidence exists)</td>
<td>• Oral Intubation</td>
</tr>
<tr>
<td>3 (weak evidence exists)</td>
<td>• BVM</td>
</tr>
</tbody>
</table>
Jensen JL, Carter A, Travers A, Dewar Z, Cain E
**Move Towards Evidence-Based Guidelines and Performance Measures**

**Gap: Objectives**

- To systematically review published clinical practice guidelines (CPGs) for quality and relevance to prehospital practice

- To identify knowledge gaps in prehospital areas of care
  - Paramedic protocol areas without relevant, high quality published CPGs
44% were 'evidence-based'

58% of paramedic protocols have no relevant CPG

223 Included

481 CPG
Clinical Practice Guidelines

<table>
<thead>
<tr>
<th>Evidence-based Guideline?</th>
<th>AGREE Score</th>
<th>Guideline</th>
<th>Relevance to EMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>5.0</td>
<td>The diagnosis and management of anaphylaxis: an updated practice parameter. - Medline</td>
<td>Highly relevant to EMS Care</td>
</tr>
<tr>
<td>YES</td>
<td>Under Review</td>
<td>Emergency treatment of anaphylactic reactions Guidelines for healthcare providers. - Medline</td>
<td>Highly relevant to EMS Care</td>
</tr>
<tr>
<td>NO</td>
<td>-</td>
<td>Subcutaneous Epinephrine for Out-Of-Hospital Treatment of Anaphylaxis - NAEMSP</td>
<td>Highly relevant to EMS Care</td>
</tr>
</tbody>
</table>

* For the purpose of the GAP project, 'evidence-based guideline' is defined as a guideline that meets both of the following criteria: 1.) systematic search (systematic = search terms stated) of at least one citation database; 2.) reference list included with the guideline.

Interventions

- Beta Agonist
  - Crystalloid Infusion
  - Glucagon
  - Steroid
- Epinephrine
- MAST

Diphenhydramine

Interventions

Beta Agonist

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>I</th>
</tr>
</thead>
</table>

Crystalloid Infusion

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>I</th>
</tr>
</thead>
</table>

Diphenhydramine
Towards National Evidence-Informed Practice Guidelines for Canadian EMS: Future Directions

Vers des directives nationales de pratiques éclairées par les données probantes pour les SMU au Canada : orientations pour l'avenir

JAN L. JENSEN, ACP, BSC, MAH SR
Dalhousie University, Division of Emergency Medical Services
Emergency Health Services Nova Scotia
Halifax, NS

THOMAS DOBSON, ACP, BA
Emergency Health Services Nova Scotia
Halifax, NS

THE CANADIAN EMS QUALITY IMPROVEMENT COMMITTEE
Move Towards Evidence-Based Performance Measures

Special Contributions

Evidence-Based Performance Measures for Emergency Medical Services Systems: A Model for Expanded EMS Benchmarking

A Statement Developed by the 2007 Consortium U.S. Metropolitan Municipalities’ EMS Medical Directors (Appendix)

J. Brent Myers, MD, MPH, Corey M. Slovis, MD, Marc Eckstein, MD, MPH, Jeffrey M. Goodloe, MD, S. Marshall Isaacs, MD, James R. Loflin, MD, C. Crawford Mechem, MD, Neal J. Richmond, MD, Paul E. Pepe, MD, MPH

Table 1. Key Treatment Elements for Various Clinical Entities Encountered by EMS Systems

<table>
<thead>
<tr>
<th>Clinical Area</th>
<th>Elements in Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST-Elevation Myocardial Infarction (STEMI)</td>
<td>Aspirin (ASA), if not allergic</td>
</tr>
<tr>
<td></td>
<td>12-Lead electrocardiograph (ECG) with prearrival activation of interventional cardiology team as indicated</td>
</tr>
<tr>
<td></td>
<td>Direct transport to percutaneous coronary intervention (PCI)</td>
</tr>
<tr>
<td></td>
<td>capable facility for ECG to PCI time &lt; 90 minutes</td>
</tr>
<tr>
<td>Pulmonary edema</td>
<td>Nitroglycerin (NTG) in absence of contraindications</td>
</tr>
<tr>
<td></td>
<td>Noninvasive Positive Pressure Ventilation (NIPPV) preferred as first-line therapy over endotracheal intubation</td>
</tr>
<tr>
<td>Asthma</td>
<td>Administration of beta-agonist</td>
</tr>
<tr>
<td>Seizure</td>
<td>Blood glucose measurement</td>
</tr>
<tr>
<td></td>
<td>Benzodiazepine for status epileptic</td>
</tr>
<tr>
<td>Trauma</td>
<td>Limit non-entrapment time to &lt; 10 minutes</td>
</tr>
<tr>
<td></td>
<td>Direct transport to trauma center for those meeting criteria, particularly those over 65 (with time consistent caveats for air medical transport situations)</td>
</tr>
<tr>
<td>Cardiac arrest</td>
<td>Response interval &lt; 5 minutes for basic CPR and automated external defibrillators (AEDs)</td>
</tr>
</tbody>
</table>
EMS Chiefs of Canada completed a Performance Measures Data Dictionary in 2012.

- **Objectives:**
  - Build national participation and consensus
  - Develop a common language
  - Support rigorous data collection, including identifying key data areas
  - Improve the sharing of performance data

- **Next Steps:**
  - Develop a national data repository
  - Determine best practices
  - Critically analyze best practices
COMMUNITY System of Care
- Witnessed
- Location
- CO-CPR instructions
- bCPR

FIRST RESPONDER System of Care
- CPR
- Defibrillation

EHS System of Care
- CPR
- Defibrillation
- Airway Management
- Drugs
- Destination

IN-HOSPITAL System of Care
- Induced Hypothermia
- PCI

ROSC & SURVIVAL TO DISCHARGE
EHS SOCCANS REPORT CARDS

COMMUNITY System of Care
- Witnessed
- Location
- CO-CPR instructions
- bCPR

FIRST RESPONDER System of Care
- CPR
- Defibrillation

EHS System of Care
- CPR
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- Drugs
- Destination

IN-HOSPITAL System of Care
- Induced Hypothermia
- PCI

2012-13 Cow Bay FD

GOLD
MFR-delivered CPR

Emergency Health Services
Interested in Trauma Research?

If you have a research project or question in mind, feel free to contact us. We can help you with:

- Designing your study, from beginning to end
- Applying for funding
- Completing ethics submissions
- Analyzing data
- Preparing posters and publications

Funding

Published Research

Interested in Trauma Research?
NS Trauma Program

• Started collecting data in ~1994
• Registry contains approximately 9500 records
• Data source for interested researchers
• Bud Avery, Program Manager: bud.avery@cdha.nshealth.ca
THE BIG ‘n’
MONEY HONEY!

Postgraduate Education Bursary
• For paramedics wishing to pursue Masters or PhD studies
  – $3000/year x 2 years

Research Performance Bursary
• To assist with costs of conducting EMS research study
  – $5000 max, can be renewed once

Knowledge Translation Bursary
• To assist with cost of travelling to present research findings
  – Max of $6000 awarded annually
EMS RESEARCH DAY 2012

• Call for Abstracts, formal review and selection process
• Keynote speaker: Dr. Tim Kilner, Coventry University
• 12 Research Presentations:
  – 8 NS
  – 2 ON
  – 1 Quebec
  – 1 NB
• Research presentations judged by 4 judges for two awards:
  *Top EMS Research Project*: Walt Tavares, Centennial College, Toronto
  *Dr. Ron Stewart Award for Top EMS Project by a Paramedic*: Mark Walker
• ~110 participants
Seek Out Opportunities to Participate in Multi-site Studies

TAC | Trauma Association of Canada
Association Canadienne de Traumatologie

CAEP | Canadian Association of Emergency Physicians
ACMU | Association canadienne des médecins d'urgence
ARECCI Ethics Decision-Support Tools for Projects

Two ethics decision-support guides have been developed by the A pRoject Ethics Community Consensus Initiative (ARECCI) Network to assist leaders and organizations in their projects. They are the ARECCI Guidelines for Quality Improvement and Evaluation Projects and the ARECCI Ethics Screening Tool.

These decision-support guides are a resource to assist integration of appropriate ethics considerations in projects to protect participants, whether the project is evaluation, quality improvement (QI), quality assurance (QA), or research.

Adding the ARECCI Ethics Guidelines for Quality Improvement and Evaluation and the ARECCI Screening Tool to your project management toolkit will provide a quick and easy system of prompts to help you with:

a) Identification of ethical considerations to be incorporated in a project, and

b) Assessment of a project to determine appropriate review requirements.

Together, these two decision-support guides can assist you in evaluating your projects to ensure that ethics considerations are included and that you have done due diligence to protect people and their health information.
FUNDING OPPORTUNITY FOR LINKING DATA

- Strategy for Patient Oriented Research (SPOR)
- Maritime researchers and institutions collaborating to submit funding for a SUPPORT unit
  - Maritime Health Data Collaborative (MHDC)
    - Focus on linking databases
    - Goal is to make data easier to collect, access and analyze for research and quality

http://www.cihr-irsc.gc.ca/e/41204.html
“Research is to see what everybody else has seen, and to think what nobody else has thought”

- Albert Szent-Gyorgyi
- Hungarian Biochemist, 1937 Nobel Prize for Medicine, 1893-1986