Multi-society State-of-the-Art Consensus Conference on Prevention of Bile Duct Injury During Cholecystectomy

Sponsored by:
SAGES
AHPBA
IHPBA
SSAT
EAES
L. Michael Brunt, MD

Disclosures:

- Institutional research support: Gore
- Chair, SAGES Safe Cholecystectomy Task Force
NIH Consensus Conference

Gallstones and Laparoscopic Cholecystectomy

NIH Consensus Development Panel on Gallstones and Laparoscopic Cholecystectomy

JAMA 1993; 269: 1018-1024
AN ANALYSIS OF THE PROBLEM OF BILIARY INJURY DURING LAPAROSCOPIC CHOLECYSTECTOMY

Steven M. Strasberg, M.D., F.R.C.S.(C), F.A.C.S, Martin Hertl, M.D., and Nathaniel J. Soper, M.D., F.A.C.S.

Causes and Prevention of Laparoscopic Bile Duct Injuries
Analysis of 252 Cases From a Human Factors and Cognitive Psychology Perspective

Lawrence W. Way, MD,* Lygia Stewart, MD,* Walter Gantert, MD,* Kingsway Liu, MD,* Crystine M. Lee, MD,* Karen Whang, MD,* and John G. Hunter, MD†

Common Bile Duct Injury During Laparoscopic Cholecystectomy and the Use of Intraoperative Cholangiography

Adverse Outcome or Preventable Error?

David R. Flum, MD; Thomas Koepsell, MD; Patrick Heagerty, PhD; Miha Sinanan, MD; E. Patchen Dellinger, MD
Conference Background/Goals

1. To identify optimal strategies for BDI prevention during cholecystectomy.

2. To develop and disseminate evidence-based practice guidelines for safe cholecystectomy.

3. The information from this conference should help inform efforts by surgical training programs, hospitals, and professional associations to create and disseminate interventions that enhance patient safety in cholecystectomy and improve patient outcomes.
Consensus Conference Timeline

- 2014 SAGES Safe Cholecystectomy Task Force formed
- 2016 joint session (SAGES, AHPBA, IHPBA) on safety in cholecystectomy at 13th International HPB Association Meeting, Sao Paulo, Brazil
- Multi-society Task Force and Steering Committee formed 2016
- Process for consensus meeting
  - Development of key questions for conference
  - Formulation of work groups/leads
  - Literature search and data extraction
  - GRADE evidence development and formulation of recommendations
  - Voting by group leads on consensus recommendations
  - Oct 20 consensus meeting and presentation of recommendations and voting by panel of experts
Consensus Conference Steering Committee

<table>
<thead>
<tr>
<th>Society</th>
<th>Representative</th>
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<tbody>
<tr>
<td>SAGES</td>
<td>Michael Brunt, Horacio Asbun</td>
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<tr>
<td>AHPBA</td>
<td>Rebecca Minter, Charles Vollmer</td>
</tr>
<tr>
<td>IHPBA</td>
<td>Oscar Imventarza</td>
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<tr>
<td>SSAT</td>
<td>Nat Soper</td>
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<tr>
<td>EAES</td>
<td>Jaap Bonjer</td>
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# Consensus Work Groups

<table>
<thead>
<tr>
<th>Work Groups</th>
<th>PICO Questions</th>
<th>Leads</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,2,3</td>
<td>Daniel Deziel, Marian McDonald</td>
<td>Maria Altieri, Ben Veenstra, Justin Gerard, Ismael Domiguez-Rosado, MacKenzie Landin</td>
</tr>
<tr>
<td>2</td>
<td>4,5</td>
<td>Michael Brunt, Adnan Alseidi, Mike Ujiki</td>
<td>Tim Schaffner, Eugene Ceppa, Sadiq Sikora, Sara Holden, Shanley Deal, Alessandro Paganini, Bailey Su</td>
</tr>
<tr>
<td>3</td>
<td>6,7,9</td>
<td>Dana Telem, Taylor Riall</td>
<td>Daniel Hashimoto, Chris Davis, Marie Crandall, Ryan Campagna, Chantal den Bakker, Leonie van Gastel, Charles Lawrence</td>
</tr>
<tr>
<td>4</td>
<td>8,11</td>
<td>Steven Strasberg, Saxon Connor, Chet Hammill</td>
<td>Blaire Anderson, Megan Thomas, Scott Dojels, Waala Abdelmoaty</td>
</tr>
<tr>
<td>5</td>
<td>10, 12-17</td>
<td>Raj Aggarwal, Carol-Anne Moulton</td>
<td>Phil Pucher, Fernando Santos, Nate Stoikes, Romeo Ignacio, Ryan Campagna, Sara Monafred</td>
</tr>
<tr>
<td>6</td>
<td>18</td>
<td>Horacio Asbun, Rowan Parks, Jaap Bonjer</td>
<td>Ewen Harrison, Luigi Boni, Oscar Imventarza, Rohan Jeyarajah, Marc Mesleh, Domenech Asbun, Levan Tsalamidze, Eline Zwart</td>
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Conference Planning:
## Expert Voting Panel

### Society Representation:
- Americas Hepato-Pancreato-Biliary Association
- European Association of Endoscopic Surgeons
- International HPB Association
- Society for Surgery of the Alimentary Tract
- Society American Gastrointestinal and Endoscopic Surgeons
- American Association for the Surgery of Trauma
- Rural/Community surgeons group
- Endoscopic and Laparoscopic Society of Asia

### Experts Panelists
- AHPBA: Chuck Vollmer, Keith Lillemoe, Attila Nakeeb, Wright Pinson, Emily Winslow, Major Kenneth Lee
- SSAT: Nat Soper, Henry Pitt, Jeff Barkun, Mark Callery
- IHPBA: Oscar Imventarza, Miguel Mercado
- SAGES: Steve Schweitzberg, Ken Murayama, Gary Vitale, Kevin Wasco
- EAES: Andrea Pietrabissa, Abe Fingerhut
- AAST: Jose Diaz, Stephen Barnes
- Rural/Community surgeons: Randy Zuckerman, Patrick Molt, Tyler Hughes
- ELSA: Alfred Buenafe, Davide Lomanto
- At Large: Go Wakabayashi
Acknowledgements

• Dimitrios Stefanidis, MD, PhD – Chair SAGES Guideline Committee
• Stephen Haggerty, MD, Co-Chair, SAGES Guideline Committee
• Mohammed Ansari, MD, MMedSci, MPhil – Research Methodologist, Univ Ottawa
• Valerie Langberg, Sc.M - Biostatistician, Brown University
• Brenda Castaneda – SAGES Staff
• Shelley Ginsburg – SAGES Staff
Conference Grant Support

• National Institutes of Diabetes and Digestive and Kidney Diseases: This conference is supported by an R13 conference grant NIDDK 1 R13 DK 120271-01. The views expressed in written conference materials or publications and by speakers and moderators do not necessarily reflect the official policies and of the Department of Health and Human Services; nor does mention by trade names, commercial practices, or organizations imply endorsement by the US government.

• SAGES Education and Research Foundation
We gratefully acknowledge educational grant support for this conference from the following:

• Boston Scientific
• Ethicon, Inc
• Intuitive Surgical
• Karl Storz Endoscopy
• Medtronic
• Stryker Endoscopy
Consensus Schedule:

8:00-9:00 Introductory session
9:00-10:00am PICOs 1-3
10:00-10:15am Break
10:15-12:15 PICOs 4-7, 9
12:10-1:00pm Buffet Lunch
1:00-1:50pm PICOs 8, 11
1:50-3:00pm PICOs 10, 12-14, 18
3:00-3:15pm Break
3:15-4:00pm PICOs 15-17
4:00-4:30pm Open Panel Discussion
4:30-4:40pm Closing Remarks
#PreventBDI

Help Us Share Live Updates from the Conference!

Use this hashtag on your social media sites during the meeting.
The Safe Cholecystectomy Didactic Modules are live!

Tailored to:
- Enhance safety
- Reduce bile duct injuries
- Lower complication rates

Access the modules at http://fesdidactic.org

Brought to you by the SAGES Safe Cholecystectomy Task Force
Multi-society State-of-the-Art Consensus Conference on Prevention of Bile Duct Injury During Cholecystectomy

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EAES
Impact of Bile Duct Injury on the Patient and Society

Dana A. Telem MD MPH
Associate Professor of Surgery
Associate Chair for Clinical Affairs
Director, Comprehensive Hernia Program
University of Michigan

Tweet: #PreventBDI
Disclosures

• Agency for Healthcare Research and Quality (AHRQ) KHS025778A
• Medtronic

• ** None relevant to the subject matter of this talk **
Cholecystectomy (LC)

- ~750,000 laparoscopic cholecystectomies/year
- Complications occur in up to 6-7% of patients*
  - Bleeding
  - Abscess
  - Bile leak
  - Bowel/vascular injury
  - Wound complications
  - Common bile duct injury (BDI)
- Impact on health resource utilization – perioperative ER utilization 10%, readmission 5-7%

Murphy et al. JACS 2010;21:73-80
Complications of LC over time

• Trends in complications of LC over time (NIS)

• Data until 2006 – still relevant

Murphy et al. JACS 2010;21:73-80
BDI

• BDI is the most *dreaded* complication

• Incidence is variable
  - Depends on whether inclusive of bile leaks
  - Up to 4 per 1000

• Data indicating incidence may be decreasing
  - NY State (2005-2010): Major BDI 0.08%
  - Buenos Aires (1991-2010): Major BDI 0.2%

*Surg Endosc. 2016*
## BDI: Contemporary Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Source</th>
<th>N</th>
<th>Total BDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schwaitzberg 2014</td>
<td>Payor admin data</td>
<td>53,632</td>
<td>82 (0.15%)</td>
</tr>
<tr>
<td>Tornqvist 2015</td>
<td>Swedish national registry</td>
<td>51,041</td>
<td>747 (1.5%; 0.36% major BDI)</td>
</tr>
<tr>
<td>Barrett 2017</td>
<td>Truven database</td>
<td>319,184</td>
<td>741 (0.23%) major BDI</td>
</tr>
<tr>
<td>Lilley 2017</td>
<td>Medicare Admin data</td>
<td>472,367</td>
<td>0.3%</td>
</tr>
<tr>
<td>Pucher 2018</td>
<td>Systematic review</td>
<td>505,292</td>
<td>0.32-0.52%</td>
</tr>
<tr>
<td>Fong 2018</td>
<td>CA State Admin data</td>
<td>711,454</td>
<td>0.22% major BDI 0.50% bile leaks</td>
</tr>
</tbody>
</table>
BDI

- Data derived from GallRiks.
  - Founded in 2005
  - National Swedish Registry for Surgery and ERCP
  - Captures ~90 per cent of all cholecystectomies
  - Aims to provide current information regarding indications, treatment methods and complications.

- 1.5% of patients had BDI (including bile leaks)

- Incidence of major BDI requiring reconstruction was 0.4%
### Distribution of BDI

- Distribution of 747 bile duct injuries among 51,041 cholecystectomies in GallRiks (2005-10)

<table>
<thead>
<tr>
<th>Type of Injury (n=747)</th>
<th>Hannover Grade</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cystic duct leak</td>
<td>A1</td>
<td>265 (35.5)</td>
</tr>
<tr>
<td>Peripheral duct injury gallbladder bed</td>
<td>A2</td>
<td>106 (14.2)</td>
</tr>
<tr>
<td>Tangential lesion common bile duct</td>
<td>C1, C2, C3</td>
<td>130 (17.4)</td>
</tr>
<tr>
<td>Transected bile duct (below hepatic bifurcation)</td>
<td>D1, D2, D3</td>
<td>16 (2.1)</td>
</tr>
<tr>
<td>Obstructive injuries</td>
<td>B1, B2</td>
<td>7 (0.9)</td>
</tr>
<tr>
<td>Lesions above the hepatic bifurcation</td>
<td>C4, D4</td>
<td>32 (4.3)</td>
</tr>
<tr>
<td>Injuries with insufficient information</td>
<td></td>
<td>191 (25.6)</td>
</tr>
</tbody>
</table>
Self-reported Incidence of BDI

• Survey administered to practicing surgeons across US (2001)

• Anonymous questionnaire mailed to 3,657 who completed an ACGME accredited residency.

• 45% (n=1,661) completed and returned the survey

• 565 self-reported bile duct injuries

**34% of surgeons self-reported a BDI**

Societal Impact OF BDI

• Significant economic healthcare burden
  ➢ **ONE BILLION** in associated health care costs

• A key source of medical malpractice claims against surgeons

• BDI malpractice claims represent 20% of money paid to plaintiffs

**Impact on Patients: Clinical**

- Numerous reinterventions/hospitalizations
- Early/late complications
- Mortality (short-term)

Table 5: Reports rates of mortality following CBD injury

<table>
<thead>
<tr>
<th>References</th>
<th>Total patients</th>
<th>CBD injury rate</th>
<th>All-cause mortality</th>
<th>Attributable mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacFadyen et al. [4]</td>
<td>114,005</td>
<td>0.50 %</td>
<td>0.06 %</td>
<td>0.03 %</td>
</tr>
<tr>
<td>Savassi-Rocha et al. [5]</td>
<td>91,232</td>
<td>0.18 %</td>
<td>4.2 %</td>
<td>–</td>
</tr>
<tr>
<td>Pitt et al. [11]</td>
<td>–</td>
<td>–</td>
<td>2.4 %</td>
<td>–</td>
</tr>
<tr>
<td>Udekwu and Sullivan [6]</td>
<td>1083</td>
<td>0.10 %</td>
<td>0.80 %</td>
<td>0.20 %</td>
</tr>
</tbody>
</table>

- Mortality (long-term) – 20.8%
  - 8.8% above the cohort’s expected age-adjusted rate of death

*Surg Endosc. 2016*
Long term Mortality

- N=800
- Mean Survival: 17.6 years
- BDI related mortality: 3.5%
Quality of Life (QOL)

• Evaluation of QOL after surgical repair of major bile duct injuries (n=89).

• Significant difference as evaluated from a psychological dimension.

• Physical and social domains comparable to control patients.

• Presence of a lawsuit was associated with a poorer QOL assessment.

Quality of Life (QOL)

- N=62 BDI

- Statistically similar:
  - Physical functioning
  - Bodily pain
  - General health perceptions
  - Vitality and social functioning
  - Mental health index

- Mean emotional scores were worse

Quality of Life (QOL) – Long Term

• Longitudinal QOL study (n=403, response 68%)

• Changes in outcome at a mean of 5.5 and 11 yrs

• At 5-years, QOL significantly worse as compared to chole and non-operative controls

• No improvement at 11 years

• 19% filed a malpractice claim
  ➢ QOL improved if claim resolved in their favor vs. if claim rejected

Quality of Life (QOL) – Long Term

• Long-term study of 800 BDI pts (compared to 175 controls) in Amsterdam

• Patients with BDI
  ➢ Significantly worse physical QoL
  ➢ Significantly worse disease specific QoL
  ➢ Increased loss of work productivity
  ➢ Increase rate of receiving daily benefits

Booij K, Ann Surg. 2018
# Quality of Life (QOL) – Long Term

<table>
<thead>
<tr>
<th></th>
<th>BDI Patients</th>
<th>Controls</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work related quality of life (WLQ)</td>
<td>n = 149</td>
<td>n = 42</td>
<td>0.01</td>
</tr>
<tr>
<td>Time management scale</td>
<td>10.0 (0–25.0)</td>
<td>0 (0–21.3)</td>
<td>0.08</td>
</tr>
<tr>
<td>Physical scale</td>
<td>10.0 (0–25.0)</td>
<td>0 (0–19.1)</td>
<td>0.07</td>
</tr>
<tr>
<td>Mental-interpersonal scale</td>
<td>12.5 (0–25.0)</td>
<td>8.3 (0–20.1)</td>
<td>0.05</td>
</tr>
<tr>
<td>Output scale</td>
<td>15.0 (0–30.0)</td>
<td>2.5 (0–25.0)</td>
<td></td>
</tr>
<tr>
<td>WLQ Productivity Loss Score</td>
<td>4.1 (0.8–7.7)</td>
<td>2.3 (0–5.6)</td>
<td>0.03</td>
</tr>
<tr>
<td>Absence from work</td>
<td>n = 391</td>
<td>n = 93</td>
<td></td>
</tr>
<tr>
<td>Paid work during LC</td>
<td>207 (52.9)</td>
<td>67 (72.0)</td>
<td>0.004</td>
</tr>
<tr>
<td>Decreased working after LC</td>
<td>106 (27.7)</td>
<td>6 (6.6)</td>
<td>0.000</td>
</tr>
<tr>
<td>Currently receiving disability benefits</td>
<td>135 (34.9)</td>
<td>18 (19.6)</td>
<td>0.004</td>
</tr>
<tr>
<td>Health and Labor Questionnaire</td>
<td>n = 399</td>
<td>n = 94</td>
<td></td>
</tr>
<tr>
<td>Hindrance domestic work</td>
<td>161 (41.7%)</td>
<td>24 (26.1%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Hindrance buying grocery</td>
<td>159 (41.1%)</td>
<td>24 (26.1%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Hindrance routine tasks</td>
<td>151 (38.9%)</td>
<td>26 (28.3%)</td>
<td>0.07</td>
</tr>
<tr>
<td>Hindrance activities with children</td>
<td>n = 161</td>
<td>n = 43</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>49 (30.4%)</td>
<td>12 (27.9%)</td>
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</table>

HLQ indicates Health and Labor Questionnaire; LC, laparoscopic cholecystectomy; WLQ, Work Limitation Questionnaire.
I went in for a lap-gallbladder removal in October 2003, was told I could go home that day after the surgery I was put in a room, very sick, the doctor told my husband, that he had nicked the bile duct, they kept me on pain meds and fluids, I kept getting worse, also on morphine for pain, on the 8th day in the hospital my husband confronted the doctor and told him he had better do something or else, he sent me to another hospital, upon arrival, after an x-ray, I was put into ICU, they could not do any surgery, because I was so swollen, all they could do was put drainage tubes (4) in my abdomen to drain the bile. (I was 136lbs when I went into the er the first time) on this 8th day I weighed 198, and had not had a bite to eat. I stayed in this hospital for 30 days until I was stable enough to go home, and was told I would have to have more surgery to repair what the first doctor did, which by the way was not a nick, my bile duct was cut completely in half. 4 months later I had the surgery after becoming very sick, and almost scratched my skin off, brome the bile in my blood. To this day I still have good days and bad, and it all ended up costing us 300,000.00 in medical bills, with no insurance we lost our home and 10 acres of land. Yes I have a law suit, it's been building going on 7 years, just heard the other day we will have our day in court Sept 2010.
Take Home

• Major BDI injury rate still in 0.4% range

• Translates to 3000 injuries/year in US

• >$1 billion in associated costs
  ½ medicolegal ½ patient care

• Key contributor to healthcare costs and adverse patient and surgeon outcomes
Thank you!

Questions?

@DanaTelem
Multi-society State-of-the-Art Consensus Conference on Prevention of Bile Duct Injury During Cholecystectomy

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Introduction to The PICO Questions

Steven M. Strasberg, M.D.
Section of Hepatobiliary and Pancreatic Surgery

Washington University in St. Louis
SCHOOL OF MEDICINE
3 Topics in 10 Minutes

1. Definition: Major/Minor Bile duct Injury
2. Incidence of BDI and Effect on Studies of BDI
3. The PICO Questions
Proposed standards for reporting outcomes of treating biliary injuries

Washington University Classification of Biliary Injuries
International Severity Grading of Biliary Injury

Grade 1: Stent or Suture

Grade 2: One duct for anastomosis or stenting

Grade 3: More than one duct for anastomosis or stenting
International Severity Grading of Biliary Injury
Major Bile Duct Injuries

Grade 2: One duct for anastomosis or stenting
Grade 3: More than one duct for anastomosis or stenting

MAJOR = Grade 2 and Grade 3
Incidence of BDI and Studies of BDI

- Major BDI in open era: 1 in 1000
- Major BDI in lap era: 3 in 1000
- 1 million LC/yr = 3000 major BDIs in the USA
- Major BDIs have aspects of rare and common problems,
- To have sufficient events for studies thousands of patients are needed.
- Drawing conclusions from fewer patients may give an illusion of safety “500 LCs with only 1 BDI”
- Probably need at least 5000-10,000 in comparative study
- Studies of BDIs themselves are probably rewarding
  20 BDIs happen in 6000 patients
## Types of Studies on BDI

1. **Observational studies of patients with bile duct injuries**
   - 10-500 patients. Small number of patients but large number of events

2. **Single or Multicenter Studies of Laparoscopic Cholecystectomy including RCTs and MAs**
   - 100-2000 patients. Larger number of patients but relatively few events

3. **Population Studies of Laparoscopic Cholecystectomies**
   - 3000-50,000+ patients. Largest number of patients with large number of events
Theoretical Study of BDI in Open vs Lap Chole with 2000 Patients

- Open Chole
  - 1000 patients

- Lap Chole
  - 1000 patients
Theoretical Study of Open vs Lap Chole with 2000 Patients

- Open Chole
  - 1000 patients
  - Projected BDI rate 0.1%
  - Events?

- Lap Chole
  - 1000 patients
  - Projected BDI rate 0.3%
  - Events?
Theoretical Study of Open vs Lap Chole with 2000 Patients

- **Open Chole**
  - 1000 patients
  - Projected BDI rate 0.1%
  - Events = 1

- **Lap Chole**
  - 1000 patients
  - Projected BDI rate 0.3%
  - Events = 3
Theoretical Study of Open vs Lap Chole with 2000 Patients

- Open Chole
  - 1000 patients
  - Projected BDI rate 0.1%
  - Events = 1

- Lap Chole
  - 1000 patients
  - Projected BDI rate 0.3%
  - Events = 3

4 events in 2000 patients.
Too few BDIs to draw conclusions

Underpowered fault
Types of Studies on BDI

1. Observational studies of patients with bile duct injuries
   - 10-500 patients. Small number of patients but large number of events

2. Single or Multicenter Studies of Laparoscopic Cholecystectomy including RCTs and MAs
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3. Population Studies of Laparoscopic Cholecystectomies
   - 3000-50,000+ patients. Largest number of patients with large number of events
The Questions
The SAGES Prevention of Bile Duct Injury Consensus Conference work group has identified the following 10 questions that should be considered for the consensus conference:

1. What is the incidence of bile duct injury (BDI) during cholecystectomy and how should these injuries be classified?
   - What is the incidence of major BDI?
   - What are the types of BDI (nature and classification)?

2. What is the impact of bile duct injuries on patient outcomes and associated health care costs?
   - What is the effect of BDI on the quality of life and longevity of the patient?
   - What are the costs to the health care system associated with BDI?
   - What are the medical-legal implications of BDI and what are the primary factors that impact outcomes of litigation?
Mother elephant delivering a baby elephant - Period of gestation twenty-two months
Prevention of Bile Duct Injury Consensus Conference

• Decision to concentrate on Guideline Development
• Use of GRADE method of guideline development
**Systematic review**

- **PICO**
  - Outcome: Critical
  - Outcome: Critical
  - Outcome: Important
  - Outcome: Not important

**Guideline development**

- Formulate recommendations:
  - For or against (direction)
  - Strong or weak (strength)

  By considering:
  - Quality of evidence
  - Balance benefits/harms
  - Values and preferences

- Revise if necessary by considering:
  - Resource use (cost)

**Rate overall quality of evidence across outcomes based on lowest quality of critical outcomes**

- "We recommend using..."
- "We suggest using..."
- "We recommend against using..."
- "We suggest against using..."
PICO Format Questions
PICO formatting frames the question

- P = population
- I = intervention
- C = comparator
- O = outcome(s)
PICO Question 8

In patients with acute cholecystitis how effective is early cholecystectomy versus delayed cholecystectomy in limiting the risk and severity of bile duct injury?
Condensed PICO Question List: State of the Art Consensus Conference on Prevention of Bile Duct Injury

1. Should one anatomic technique (CVS) vs another (infundibular, top down, IOC) be used to reduce or limit risk of BDI during cholecystectomy (CCX)?
2. Should the top down technique vs subtotal cholecystectomy be used when the CVS cannot be achieved?
3. How should the CVS be documented during laparoscopic cholecystectomy (still doublet photos vs operative notes vs video vs no documentation)?
4. Should intraoperative biliary imaging (e.g. intraoperative cholangiography, US) vs no intraoperative biliary imaging be used for limiting the risk of bile duct injury during laparoscopic cholecystectomy?
5. Should near infrared vs IOC or white light be used in avoiding /limiting BDI?
6. Should surgical (complexity) risk stratification vs alternative or no risk stratification be used for limiting/preventing BDI?
7. Should risk stratification that accounts for cholecystolithiasis vs no/alternate risk stratification be used for limiting/preventing BDI?
8. Should immediate cholecystectomy (within 72 hrs from symptom onset) vs CCX delayed beyond 72 hours (< 6 weeks vs >6-12 weeks) be used for acute cholecystitis?
9. Should subtotal CCX vs total laparoscopic or open CCX be used for limiting/avoiding BDI in marked acute inflammation or chronic biliary inflammatory fusion (BIF)?
10. Should 4-port lap cholecystectomy vs reduced port/single incision vs robotic CCX be used for limiting/avoiding BDI?
11. Should interval/delayed lap cholecystectomy vs no additional treatment be used for patients previously treated by percutaneous cholecystostomy?
12. Should conversion of laparoscopic to open cholecystectomy vs no conversion be used for limiting/avoiding BDI in the difficult laparoscopic cholecystectomy?
13. Should a time out to verify the CVS vs no time out be used for limiting/avoiding BDI?
14. Should two vs one surgeon(s) be used for limiting/avoiding BDI?
15. Should CVS coaching of surgeon vs no coaching be used for limiting/avoiding BDI?
16. Should training by simulation or video-based education vs alternative surgeon training be used for limiting/avoiding BDI?
17. Should more vs less surgeon experience be used for limiting/avoiding the risk of BDI?
18. Should immediate reconstruction by the operating surgeon vs referral to a specialty center be used for patients with BDI during cholecystectomy?
18 PICO Questions: Focussed Mainly on Prevention of Bile Duct Injury

- PICO 1-5: Anatomic identification in CCX
- PICO 6-8: Role of disease and patient factors
- PICO 9-12: Place of surgical techniques other than laparoscopic total cholecystectomy
- PICO 13-17: Role of the surgeon and education of the surgeon
- PICO 18: Management of bile duct injury
18 PICO Questions Focussed Mainly on Prevention of **Bile Duct Injury**

- It was expected that much data would be available for some question while little data would be available for others.

- Therefore some data rich questions will result in recommendations coming directly from the GRADE review (when to operate in AC) while other data poor ones will act as stimuli and pathways for studies which experts consider most important for future development the field of biliary injury prevention (does coaching/simulation reduce BDI)
Recommendations PICO 8: Can be Type A or B

- Type A recommendations flow from the data in the GRADE process. Currently available evidence supports the recommendations.

- Type B recommendations flow from recognition of deficiencies in our knowledge which were also identified during the GRADE review and these recommendations relate to studies to be done or study methodology in the future.
The PICO Questions

Steven M. Strasberg, M.D.
Section of Hepatobiliary and Pancreatic Surgery
Multi-society State-of-the-Art Consensus Conference on Prevention of Bile Duct Injury During Cholecystectomy

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Formulating and Answering a Guideline Question

Mohammed T. Ansari (MD, MMedSc, MPhil)
Consultant Guideline Methodologist
Adjunct Professor, University of Ottawa
Scientific Evaluator, Health Canada
Disclosure of Conflicts of Interest

• Financial – none
• Intellectual – none
The GRADE Approach

• GRADE: The Grading of Recommendations Assessment, Development and Evaluation

• Methods approach developed collaboratively by many international organizations

• Adopted by more than 100 organizations (e.g. the World Health Organization, the UK National Institute for Health and Care Excellence, etc)

• Now considered the standard in guideline development
Guideline Question

• A Guideline question addresses variability and uncertainty in clinical practice

• The question may be about etiology, therapy, diagnosis, or prognosis

• Guideline questions are phrased in a language that reflects the relevant decision-making equipoise

• The usual presentation of the Q is:

  Should option A vs. option B be used for a condition, a state of health, health purpose, or population
Question Specific PICO

• Population, intervention, comparator and outcome(s)

• Potential challenges:
  - how broadly the patients and intervention should be defined (mild or severe disease, low or higher dose, class effect or specific drugs?)
  - multiple comparators (no treatment, alternative therapy or therapies)
  - specification of patient-oriented outcomes (usually: morbid and mortal events, hospitalization, QOL, disability, inconvenience, resource use, and unintended harms)
Outcome Prioritization

• Categories: critical, important, and limited importance on a 1-9 scale
• Importance varies by perspective – for CPGs, the perspective would generally be that of the patient
• Evidence of patient values and preferences and associated variability should be sought
• 3 Steps – preliminary classification, reassessment in light of evidence, and judging the balance between the desirable and undesirable effects
Outcome Proxies (contingency!)

- Surrogate outcome must be in the causal pathway of the disease process.
- Surrogate end point must capture the net effect of the treatment on the patient-important outcome.
- Examples – narcotic consumption for postop pain, Hb for blood loss, CVS for BDI.....
Example Q: Should fewer than four ports vs. four ports be used for laparoscopic cholecystectomy?

• **Population** – patients undergoing laparoscopic cholecystectomy (elective or emergency) for any reason

• **Intervention** – Single-port, single-incision LCCX

• **Comparator** – Standard four-port LCCX

• **Outcomes** – BDI, readmission, total analgesic consumption, total serious or major complications, duration of surgery, and failure to complete cholecystectomy

• Proxy outcomes: CVS, conversion, intraoperative blood loss
Formulate question
- Select outcomes
- Rate importance

Outcomes across studies

Create evidence profile with GRADEpro

Rate quality of evidence for each outcome
- Randomization increases initial quality
  1. Risk of bias
  2. Inconsistency
  3. Indirectness
  4. Imprecision
  5. Publication bias

High
Moderate
Low
Very low

Summary of findings & estimate of effect for each outcome

Evidence synthesis

Recommendation
Grade recommendations
- For or against (direction) \(\uparrow\downarrow\)
- Strong or conditional/weak (strength)

By considering balance of:
- Quality of evidence
- Balance benefits/harms
- Values and preferences

Revise if necessary by considering:
- Resource use (cost)

Formulate Recommendations (\(\uparrow\downarrow\) | \(\oplus\...\))
- "The panel recommends that ....should..." (\(\uparrow\uparrow\) | \(\oplus\...\))
- "The panel suggests that ....should..." (\(\uparrow\) | \(\oplus\...\))
- "The panel suggests to not ..." (\(\downarrow\) | \(\oplus\...\))
- "The panel recommends to not..." (\(\downarrow\downarrow\) | \(\oplus\...\))

Guideline
Introduction to GRADE Approach for Rating Certainty of Evidence
Grading Certainty of Evidence

**Definition of CoE**: the extent of our confidence that the estimates of the effect are correct or are adequate to support a particular decision or recommendation

- Outcome specific
- Applies to the *Body* of contributing evidence (a meta-analysis or a narrative synthesis)
- Rated as High, moderate, low or very low
## Fewer-than-four ports versus four ports for laparoscopic cholecystectomy: serious adverse events, CDSR 2014

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Fewer ports LC n/N</th>
<th>Standard ports LC n/N</th>
<th>Risk Ratio M-H,Fixed,95% CI</th>
<th>Weight</th>
<th>Risk Ratio M-H,Fixed,95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>One port</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abd Ellatif 2013</td>
<td>0/125</td>
<td>0/125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bucher 2011</td>
<td>0/75</td>
<td>0/75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herrero 2012</td>
<td>1/26</td>
<td>0/24</td>
<td></td>
<td>25.7 %</td>
<td>2.78 [ 0.12, 65.08 ]</td>
</tr>
<tr>
<td>Lirici 2011</td>
<td>1/20</td>
<td>0/20</td>
<td></td>
<td>24.8 %</td>
<td>3.00 [ 0.13, 69.52 ]</td>
</tr>
<tr>
<td>Luna 2013</td>
<td>0/20</td>
<td>0/20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saad 2013</td>
<td>3/35</td>
<td>0/35</td>
<td></td>
<td>24.8 %</td>
<td>7.00 [ 0.37, 130.69 ]</td>
</tr>
<tr>
<td>Sinan 2012</td>
<td>1/17</td>
<td>0/17</td>
<td></td>
<td>24.8 %</td>
<td>3.00 [ 0.13, 68.84 ]</td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>318</strong></td>
<td><strong>316</strong></td>
<td></td>
<td>100.0 %</td>
<td><strong>3.93 [ 0.86, 18.04 ]</strong></td>
</tr>
</tbody>
</table>

Total events: 6 (Fewer ports LC), 0 (Standard ports LC)
Heterogeneity: $\chi^2 = 0.25$, df = 3 (P = 0.97); $I^2 = 0.0$
Test for overall effect: $Z = 1.76$ (P = 0.078)
Test for subgroup differences: Not applicable
### Example of an Evidence Profile

(< 4 ports vs. 4 ports for Lap Chole)

<table>
<thead>
<tr>
<th></th>
<th>Certainty assessment</th>
<th>No of patients</th>
<th>Effect</th>
<th>Certainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>N of studies</td>
<td>Study design</td>
<td>Risk of bias</td>
<td>Inconsistency</td>
<td>Indirectness</td>
</tr>
<tr>
<td>Serious Adverse Events</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>randomised trials</td>
<td>very serious</td>
<td>not serious</td>
</tr>
<tr>
<td>Conversion to Open Cholecystectomy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>randomised trials</td>
<td>very serious</td>
<td>not serious</td>
</tr>
</tbody>
</table>
## Quality of Evidence Domains

*G. Guyatt et al. / Journal of Clinical Epidemiology 64 (2011) 383–394*

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Quality of Evidence</th>
<th>Lower if</th>
<th>Higher if</th>
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<tbody>
<tr>
<td>Randomized trial</td>
<td>High</td>
<td>Risk of bias</td>
<td>Large effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1 Serious</td>
<td>+1 Large</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 Very serious</td>
<td>+2 Very large</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inconsistency</td>
<td>Dose response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1 Serious</td>
<td>+1 Evidence of a gradient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 Very serious</td>
<td>All plausible confounding</td>
</tr>
<tr>
<td>Observational study</td>
<td>Low</td>
<td>Indirectness</td>
<td>+1 Would reduce a demonstrated effect or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1 Serious</td>
<td>+1 Would suggest a spurious effect when</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 Very serious</td>
<td>results show no effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imprecision</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1 Serious</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 Very serious</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Imprecision</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>-1 Serious</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 Very serious</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Publication bias</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1 Likely</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 Very likely</td>
<td></td>
</tr>
</tbody>
</table>
THANK YOU!

....................................................Questions?
Multi-society State-of-the-Art Consensus Conference on Prevention of Bile Duct Injury During Cholecystectomy

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SAGES
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EAES
SAGES Guideline Development Process

Dimitrios Stefanidis, MD, PhD
Chair, SAGES guidelines committee
Vice Chair of Education
Chief, MIS/ Bariatric Surgery
Indiana University School of Medicine
Disclosures

- Nothing to disclose
Evidence-based Medicine (EBM)

Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.

- Clinician training and experience
- Judicious integration of science
- Patient preferences and values
Guidelines

• Systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances

  *Institute of Medicine*

• Guidelines provide the framework of EBM

• Clinicians, policy makers, and payers see guidelines as a tool for making care more consistent and efficient and for closing the gap between what clinicians do and what scientific evidence support
Why are Guidelines Needed?

- **Rising healthcare costs** fueled by increased demand for care, more expensive technologies, and an ageing population
- **Variations in service delivery** among providers, hospitals, and geographical regions and the presumption that at least some of this variation stems from inappropriate care, either overuse or underuse of services
- The intrinsic desire of healthcare professionals to offer, and of patients to receive, **the best care possible**
Results of Non-Adherence to EBM: Quality Gaps

Preventive care deficiencies
- Child immunizations: 76%
- Influenza vaccine: 52%
- Pap smear: 82%

Acute care deficiencies
- Antibiotic misuse: 30-70%
- Prenatal care: 74%

Surgery care deficiencies
- Inappropriate hysterectomy: 16%
- Inappropriate CABG surgeries: 14%

Chronic care deficiencies
- Beta blockers: 50%
- Diabetes eye exam: 53%

Hospital care deficiencies
- Proper CHF care: 50%
- Preventable deaths: 14%
- Preventable ADEs: 1.8/100 admits
- Life threatening: 20%
- Serious: 43%

Health Services...
- Safe
- Effective
- Patient-centered
- Timely
- Efficient
- Equitable
Benefits of Guidelines

**Patients**
- Improve health outcomes
- Improve the consistency of care
- Inform patients about what their clinicians should be doing
- Empower patients to make more informed healthcare choices and to consider their personal needs and preferences in selecting the best option
- Can help patients by influencing public policy

**Physicians**
- Improve the quality of clinical decisions
  - call attention to ineffective, dangerous, and wasteful practices
- Support quality improvement activities
  - Development of standing orders, care pathways, algorithms, etc
- Identify gaps in the evidence and research needed
- May offer medicolegal protection
- Prompt government or private payers to provide coverage or to reimburse doctors for services
# Potential Limitations & Harms

## Patients
- Flawed guidelines can result in suboptimal, ineffective, or harmful practices
- Inflexible guidelines can harm by leaving insufficient room for clinicians to tailor care to patients' needs
- Imprudent recommendations for costly interventions may displace limited resources that are needed for other services of greater value to patients

## Physicians
- Flawed guidelines harm practitioners by providing inaccurate scientific information and clinical advice, thereby compromising the quality of care
- A negative (or neutral) recommendation may prompt providers to withdraw availability or coverage
- Auditors and managers may unfairly judge the quality of care based on criteria from invalid guidelines
- Citable evidence for malpractice litigation
SAGES Guidelines Development Process
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Working groups determined by steering committee</td>
</tr>
<tr>
<td>2</td>
<td>Definition of Key Questions (PICO methodology)</td>
</tr>
<tr>
<td>3</td>
<td>Systematic Literature Search</td>
</tr>
<tr>
<td>4</td>
<td>Abstract Review</td>
</tr>
<tr>
<td>5</td>
<td>Full Paper Review</td>
</tr>
<tr>
<td>6</td>
<td>Data Extraction and Analysis</td>
</tr>
<tr>
<td>7</td>
<td>Guidelines Panel Recommendation Formulation &amp; Voting</td>
</tr>
<tr>
<td>8</td>
<td>Consensus Conference with Expert Voting (validation)</td>
</tr>
<tr>
<td>9</td>
<td>Public comment period and Publication</td>
</tr>
<tr>
<td>Work Groups</td>
<td>PICO Questions</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------</td>
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<tr>
<td>2</td>
<td>4,5</td>
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<td>3</td>
<td>6,7,9</td>
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<td>4</td>
<td>8,11</td>
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<tr>
<td>5</td>
<td>10, 12-17</td>
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<tr>
<td>6</td>
<td>18</td>
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# Literature Search

<table>
<thead>
<tr>
<th>Concept A</th>
<th>Concept B</th>
<th>Concept C</th>
</tr>
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<tbody>
<tr>
<td><strong>MESH terms</strong></td>
<td>Cholecystectomy OR cholecystectomy, laparoscopic AND robotics OR robotic surgical procedures AND bile ducts or common bile duct OR bile ducts, extrahepatic OR bile ducts, intrahepatic</td>
<td>Cholecystectomy OR cholecystectomy, laparoscopic AND robotics OR robotic surgical procedures AND bile ducts or common bile duct OR bile ducts, extrahepatic OR bile ducts, intrahepatic</td>
</tr>
<tr>
<td><strong>Textwords</strong></td>
<td>infundibular technique AND bile duct injury</td>
<td>Top-down technique AND bile duct injury</td>
</tr>
</tbody>
</table>

**SEARCH STRATEGY:**

1. MT1 or MT2 or TW1 or TW2
2. MT3 or TW3 or TW4
3. MT4 or MT5 or TW5 or TW6
4. 1 and 2 and 3
A cost-effectiveness analysis of intraoperative cholangiography in the prevention of bile duct injury during laparoscopic cholecystectomy.

Journal: Journal of the American College of Surgeons

Authors: Flum DR and Flowers C and Veenstra DL

BACKGROUND: Recent population-based studies have demonstrated that the use of intraoperative cholangiography (IOC) during laparoscopic cholecystectomy (LC) is associated with a decrease in the rate of common bile duct (CBD) injury. The cost implications of a management strategy involving routine IOC use have not been adequately evaluated. STUDY DESIGN: Decision analytic models were developed to analyze costs and benefits of routine IOC use during LC. The models were used to calculate the cost per life saved, cost per CBD injury avoided, and incremental cost of IOC when used routinely. Transition probabilities, costs, and outcomes were derived from published sources. Sensitivity analyses were used to account for uncertainty in these estimates. RESULTS: Using base-case estimates, management of patients undergoing LC with routine IOC would cost 100 dollars more per LC. Routine IOC would prevent 2.5 deaths for every 10,000 patients at a cost of 390,000 dollars per life saved (13,900 dollars per life year saved). The cost per CBD injury avoided with IOC use is 87,143 dollars. The cost per CBD injury avoided is less for procedures done in high-risk patients (approximately 8,000 dollars) or by less experienced surgeons (approximately 61,000 dollars). CONCLUSIONS: These models describe settings where the cost of IOC and the reduction in CBD injury rates make routine IOC use cost effective. Routine IOC use among less experienced surgeons and in high-risk operations is the most cost effective, but the cost implications of routine use for the general population should also be considered cost effective.

keywords: Bile Duct Diseases/economics; etiology/mortality/*prevention & control; Biliary Tract Surgical Procedures/economics, Cholangiography/*economics, Cholecystectomy, Laparoscopic/*adverse effects; Common Bile Duct/*injuries/*surgery; Cost-Benefit Analysis, Humans, Monitoring, Intraoperative/*economics/methods, Outcome Assessment (Health Care), United States

ID: 10019465
Abstract and Full Paper Review

- 2,475 abstracts screened
  - 714 included
  - 1761 excluded
- 714 full papers reviewed
  - 400 extracted
  - 314 excluded
**GENERAL STUDY DATA**

<table>
<thead>
<tr>
<th>EXTRACTOR (YOUR NAME)</th>
<th>PAPER REF ID</th>
<th>LAST NAME 1st AUTHOR</th>
<th>PUB. YEAR</th>
<th>RELEVANT PICO/KEY Question</th>
<th>STUDY DESIGN</th>
<th>DESIGN-OTHER (specify)</th>
<th>CENTER(s)</th>
<th>TOTAL SAMPLE SIZE (numbers only)</th>
<th>FUNDING</th>
<th>REGION OF STUDY (if applicable insert countries)</th>
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**PICO DATA**

<table>
<thead>
<tr>
<th>OUTCOME DOMAIN</th>
<th>OUTCOME DEFINTION/DETAILS</th>
<th>SUMMARY POPULATION DESCRIPTION (study level, age range)</th>
<th>DESCRIPTOR: INTERVENTION, COMPARATOR, CONTROLS, PROCEDURES, ANALYSIS</th>
<th>INTERVENTION DETAILS TEXT BOX</th>
<th>COMPARATOR DETAILS TEXT BOX</th>
<th>OUTCOME MEASUREMENT</th>
<th>OUTCOME CHARACTERISTIC</th>
<th>OUTCOME METRIC</th>
<th>N analyzed relevant to outcome of interest</th>
<th>Data of Interest</th>
<th>Type of Analysis</th>
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</thead>
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**RESULTS INTERVENTION ARM (numbers only)**

<table>
<thead>
<tr>
<th>Events or Cases - Intervention group</th>
<th>Mean/median - Intervention group</th>
<th>Standard Deviation for Mean for Intervention group</th>
<th>Standard Error for Mean for Intervention group</th>
<th>Interquartile range (IQR) for median for Intervention group</th>
<th>Range for median for Intervention group</th>
<th>Total number of patients - Intervention group</th>
</tr>
</thead>
</table>

**RESULTS COMPARATOR ARM (numbers only)**

<table>
<thead>
<tr>
<th>Events or Cases - Comparator group</th>
<th>Mean/median - Comparator group</th>
<th>Standard Deviation for Mean for Comparator group</th>
<th>Standard Error for Mean for Comparator group</th>
<th>Interquartile range (IQR) for median for Comparator group</th>
<th>Range for median for Comparator group</th>
<th>Total number of patients - Comparator group</th>
</tr>
</thead>
</table>

**RISK OF BIAS ASSESSMENT**

<table>
<thead>
<tr>
<th>Bias about selection of participants</th>
<th>SQ</th>
<th>DJ</th>
<th>SQ</th>
<th>DJ</th>
<th>SQ</th>
<th>DJ</th>
<th>SQ</th>
<th>DJ</th>
<th>Other biases not accounted for</th>
<th>OVERALL BIAS JUDGMENT</th>
<th>Support for judgment of bias (Text Box)</th>
</tr>
</thead>
</table>

- **Assessor:** [Name]
- **Conclusions:**
  - Judgment about bias due to randomization of cluster or baseline
  - Concerns about adherence to or implementation of the intended intervention
  - Concerns that the setting influenced the intervention
  - Concerns about the intervention or comparator being different between clusters due to a different intervention
  - Concerns about blinding of participants and personnel
  - Concerns about blinding of outcome assessment
  - Concerns about comparability of clusters or baselines
  - Concerns about the intervention or comparator being different between clusters due to a different intervention
  - Concerns about blinding of participants and personnel
  - Concerns about blinding of outcome assessment
  - Concerns about the setting influenced the intervention
  - Concerns about adherence to or implementation of the intended intervention
  - Concerns about the intervention or comparator being different between clusters due to a different intervention
  - Concerns about blinding of participants and personnel
  - Concerns about blinding of outcome assessment
  - Concerns about comparability of clusters or baselines

**Domain:**
- SQ: [Specific Question]
- DJ: [Decision Judgment]

**Overall BIas JUDGMENT:**
- [Overall Bias]

**Support for judgment of bias (Text Box):**
- [Details or Evidence]

---

**Data Extraction**
Data Analysis

Preven
<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>SUMMARY OF JUDGEMENTS</th>
<th>IMPORTANCE FOR DECISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIRABLE EFFECTS</td>
<td>Trivial</td>
<td>Small</td>
</tr>
<tr>
<td>UNDESIRABLE EFFECTS</td>
<td>Large</td>
<td>Moderate</td>
</tr>
<tr>
<td>CERTAINTY OF EVIDENCE</td>
<td>Very low</td>
<td>Low</td>
</tr>
<tr>
<td>VALUES</td>
<td>Important uncertainty or variability</td>
<td>Possibly important uncertainty or variability</td>
</tr>
<tr>
<td>BALANCE OF EFFECTS</td>
<td>Favors the comparison</td>
<td>Probably favors the comparison</td>
</tr>
<tr>
<td>ACCEPTABILITY</td>
<td>No</td>
<td>Probably no</td>
</tr>
<tr>
<td>FEASIBILITY</td>
<td>No</td>
<td>Probably no</td>
</tr>
</tbody>
</table>
Recommendation Formulation

- Recommendation
- Justification
- Subgroup considerations

- Implementation considerations
- Monitoring and Evaluation
- Research Priorities

TYPE OF RECOMMENDATION

- Strong recommendation against the intervention
- Conditional recommendation against the intervention
- Conditional recommendation for either the intervention or the comparison
- Conditional recommendation for the intervention
- Strong recommendation for the intervention
Recommendations

• GRADE recommendations
• Type B recommendations
  • Other non GRADE recommendations often related to future research

• Did not consider cost
  • Focus on patients
  • Severely limited available evidence

• Panel voting – social aspect/ stakeholder agreement
  • Low quality of evidence
  • >80% panel agreement in all recommendations
Expert Validation of Recommendations

State of the Art Consensus Conference on Prevention of Bile Duct Injury During Cholecystectomy

Saturday, October 20, 2018 • Seaport Hotel & World Trade Center • Boston, MA

Prevent Bile Duct Injury Consensus Conference
Prevent BDI Consensus Conference
Meeting and Voting Process

Presentation of PICO question/recommendation/justification and evidence

Voting by expert panel
Voting by audience (MD’s only)

If > 80% agreement by **expert panel**, recommendation is approved
If < 80% agreement by **expert panel**, discussion by expert panel
(open audience discussion after expert panel)

Revote or reconsider/revise for later consideration
Consensus Recommendations (from GRADE Handbook)

• Two types of recommendations:
  • Strong - confident that the desirable effects of an intervention outweigh its undesirable effects (strong recommendation for an intervention) or that the undesirable effects of an intervention outweigh its desirable effects (strong recommendation against an intervention)
    Implies that most or all individuals will be best served by the recommended course of action.
  • Conditional – desirable effects probably outweigh undesirable effects or undesirable effects probably outweigh the desirable effects (weak recommendation against an intervention) but appreciable uncertainty exists
    Depending on patient values, resources available or setting

• Panel should consider both the content and strength of the recommendation in voting
Consensus Recommendations for Future Studies: Type B Recommendations

• Criteria:
  • There is insufficient evidence to support a decision for or against an intervention
  • Further research has large potential for reducing uncertainty about the effects of the intervention
  • Further research is thought to be of good value for the anticipated costs

• Panel voting to help establish prioritization for the proposed studies

From GRADE Handbook
https://gdtGRADE.ORG/app/handbook/handbook.html#h.w29yp7vuyzwo
Consensus Post Meeting

• Recommendations posted for one month for public comment

• https://www.preventbdi.org/
https://pollev.com/bdicc
Prevent BDI Consensus Conference
Workgroup I: PICO#1 - 3

- Co-leads: Marian McDonald, Daniel Deziel
- Maria Altieri
- Benjamin Veenstra
- Justin Gerard
- MacKenzie Landin
- Ismael Dominguez-Rosado
PICO # 1

Should the critical view of safety (CVS) vs. other methods (e.g. infundibular, top down, or intraoperative cholangiography) be used to mitigate the risk of bile duct injury during laparoscopic cholecystectomy?
PICO #1: Method Anatomic Identification

Recommendation

In patients undergoing laparoscopic cholecystectomy, we suggest that surgeons use the critical view of safety for anatomic identification of the cystic duct and cystic artery.

Conditional recommendation
Very low certainty of evidence
PICO # 1: Method Anatomic Identification: Summary of Literature Reviewed

- 3 Systematic Reviews (2002-2011)
- 1 Prospective RCT (2011)
- 1 Retrospective Comparative Study (2011)
- 4 Case Series (2000-2014)
- 6 Survey Studies (1997-2018)
- 7 Expert Opinion Papers (2002-2018)

Insufficient for meta analysis
1. Using CVS, large institutional studies demonstrate lower than expected rates of bile duct injury.

**Observed rate**: 0 – 0.07%

**Expected rate**: 0.2 – 0.4%

**O/E**: 0.125 – 0.25

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>N</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palanivelu</td>
<td>2007</td>
<td>9,864</td>
<td>0.07% BDI</td>
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<tr>
<td>Yegiyants</td>
<td>2008</td>
<td>3,042</td>
<td>0 BDI</td>
</tr>
<tr>
<td>Avgerinos</td>
<td>2009</td>
<td>998</td>
<td>0 BDI</td>
</tr>
<tr>
<td>Tsalis</td>
<td>2015</td>
<td>873</td>
<td>0 BDI</td>
</tr>
</tbody>
</table>
2. Combined cohort studies using CVS demonstrate a lower rate of BDI compared to combined cohort studies using infundibular approach.

**CVS:** 1 BDI/5,421 cases (0.018%)
**Infundibular:** 5 BDIs/6,810 cases (0.07%)
PICO # 1: Indirect evidence for CVS

3. Case series of bile duct injuries with analysis of mechanism of injury (videos, OR reports) do not document use of critical view of safety

- Booij, 2014: 528 BDIs: CVS documented in 33 (6.3%)
- Nijssen, 2015: 11 BDIs with video: No CVS
- Strasberg, 2000: 21 BDIs: No CVS
Little evidence that CVS, or attempt to achieve CVS, is associated with undesirable effects

One report of 600 selected LCs with 7 BDIs:
1 BDI occurred while dissecting CVS
Kohn, 2017
**PICO #1: Data Summary Laparoscopic Top Down (Fundus-First) Method**

1. Combined 13 cohort studies/1,181 cases: Deemed “safe & effective” in difficult cases based on conversion rate and complications (BDI rate not specified).

2. Prospective randomized trial “contracted” GB:

<table>
<thead>
<tr>
<th></th>
<th>33 fundus-first</th>
<th>vs.</th>
<th>31 standard LC</th>
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<tbody>
<tr>
<td>BDI</td>
<td>0</td>
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<td>2</td>
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*(Huang, 2011)*
3. Case series 30 laparoscopic BDIs (plus 152 open chole BDIs) found all occurred with hilar first (vs. fundus-first) dissection. *Yang, 2002*

4. Case series 8 “extreme” vasculobiliary injuries found all occurred with fundus-first dissection after lap converted to open. *Strasberg, 2012*
1. IOC use associated with fewer BDIs, lower severity BDI, more frequent intraoperative detection of BDI.
   Causal relationship not conclusive.

2. Laparoscopic ultrasonography may prevent BDI in difficult cases.
   12 studies/7,905 cases.

Note: Additional data on intraoperative imaging addressed in PICO # 4
## PICO #1: Use of CVS

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>SUMMARY OF JUDGEMENTS</th>
<th>IMPORTANCE FOR DECISION</th>
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<tr>
<td>DESIRABLE EFFECTS</td>
<td>Trivial</td>
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### TYPE OF RECOMMENDATION

- **Conditional recommendation for the intervention**
- **Strong recommendation against the intervention**
- **Conditional recommendation against the intervention**
- **Conditional recommendation for either the intervention or the comparison**
- **Strong recommendation for the intervention**
In patients undergoing laparoscopic cholecystectomy, we suggest that surgeons use the critical view of safety for anatomic identification of the cystic duct and cystic artery. 

Conditional recommendation
Very low certainty of evidence

Additional consideration: When the CVS cannot be achieved safely (e.g. due to pathologic alterations of, or native variations in, biliary anatomy, we suggest that surgeons consider intraoperative imaging for anatomic identification.
Vote on PICO 1 Recommendation
PICO # 2

Should the **top down technique** of total cholecystectomy versus **subtotal cholecystectomy** be used to mitigate the risk of bile duct injury when critical view of safety cannot be achieved during laparoscopic cholecystectomy?
PICO #2: Top Down vs. Subtotal Recommendation

When the critical view of safety cannot be achieved and the biliary anatomy cannot be clearly defined by other methods (e.g. imaging) during laparoscopic cholecystectomy, we suggest that surgeons consider subtotal cholecystectomy over total cholecystectomy by the top down approach.

Conditional recommendation
Very low certainty of evidence
PICO #2: Subtotal vs. Top down

Summary of Literature Reviewed

2 Systematic Reviews (2011, 2015): 30 unique studies
10 additional cohort studies (1993-2017)
1 Prospective RCT (2011)
2 Administrative database studies (2012, 2017)
2 case series (2002, 2011)

Insufficient for meta analysis

Note: Additional data on subtotal cholecystectomy addressed in PICO #9
1. Combined 13 cohort studies/ 1,181 cases: Deemed “safe & effective” in difficult cases based on conversion rate and complications (BDI rate not specified).

2. Prospective randomized trial “contracted” GB:

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(Huang, 2011)
PICO # 2: Data Summary Laparoscopic Top Down (Fundus-First) Method

3. Case series 30 laparoscopic BDIs (plus 152 open chole BDIs) found all occurred with hilar first (vs. fundus-first) dissection. Yang, 2002

4. Case series 8 “extreme” vasculobiliary injuries found all occurred with fundus-first dissection after lap converted to open. Strasberg, 2012
PICO # 2: Data Summary Laparoscopic Subtotal Cholecystectomy

1. 1,868 lap subtotals from 39 studies
   BDI: 2/1,460 cases (0.14%)
   Conversion: 202/1,850 cases (10.9%)

2. Administrative database studies
   a) UHS Consortium: Lap Subtotal (N = 487) vs. Lap Total (N = 131,082)
      1:1 propensity score match: no difference mortality, LOS, readmits
      (Kim, 2017)
   b) NIS: 3.3% BDI (360/10,872) cases lap subtotal, open subtotal &
      “trocar” cholecystostomy. No difference in BDI between laparoscopic
      vs. converted subtotal cholecystectomy (Lee, 2012)
PICO # 2: Literature Summary

1. No direct comparative studies of laparoscopic subtotal vs. laparoscopic top down total cholecystectomy.
2. Each has been safely performed in selected cases.
3. Each has been associated with morbidity in some cases.
4. There are no standardized selection criteria as to when these methods are best applied.
### PICO #2: Top down vs. subtotal

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Conditional recommendation
Very low certainty of evidence
Vote on PICO 2 Recommendation
How should the critical view of safety be documented during laparoscopic cholecystectomy (still doublet photos vs. operative notes vs. video vs. no documentation)?
When performing laparoscopic cholecystectomy, we suggest that surgeons incorporate documentation of the critical view of safety by doublet photography or video in addition to written documentation.

Conditional recommendation
Very low certainty of evidence
PICO #3: Documentation of CVS
Summary of Literature Reviewed

5 Cohort Studies
1 Survey Study

Insufficient for meta analysis
PICO # 3: Documentation of CVS: Data Summary

5 cohort studies/368 cases: No BDIs.
• Description of CVS in OR dictations is poor compared to photos or video.
• Videos superior to OR notes (Wauben 2011, Plaisier 2001) and to CVS photos with 2 views (Emous 2010).
• CVS photos with 2 views were superior to photos with one view (Sanford 2014).
• IOC superior to CVS photos with one view (Buddingh 2012).

Survey study: surgeons using CVS. 80% document in OR report, 43% by photo, 30% by video (Buddingh 2011).
### PICO # 3: Documentation CVS

#### Criteria

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PICO # 3: Documentation of CVS

Recommendation

When performing laparoscopic cholecystectomy, we suggest that surgeons incorporate documentation of the critical view of safety by doublet photography or video in addition to written documentation.

Conditional recommendation
Very low certainty of evidence
Vote on PICO 3
Recommendation